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RF POWER OUTPUT DATA

The input supply to the transmitter was set at 3.6 Volts. 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: 0.507W
Measured DC voltage: 3.6V
Measured DC current: 680mA
Measured RF input: 9.77mW

800 Mhz Digital CDMA

In Digital Mode the values measured for RF Output, DC Current and RF Input Power are all average values which reflect a 100% transmit duty cycle in CDMA operation.

Measured RF output: 0.332W
Measured DC voltage: 3.6V
Measured DC current: 650mA.
Measured RF input: 1.28mW

1900 Mhz Digital CDMA

In Digital Mode the values measured for RF Output, DC Current and RF Input Power are all average values which reflect a 100% transmit duty cycle in CDMA operation.

Measured RF output: 0.277W
Measured DC voltage: 3.6V
Measured DC current: 675mA.
Measured RF input: 1.62mW

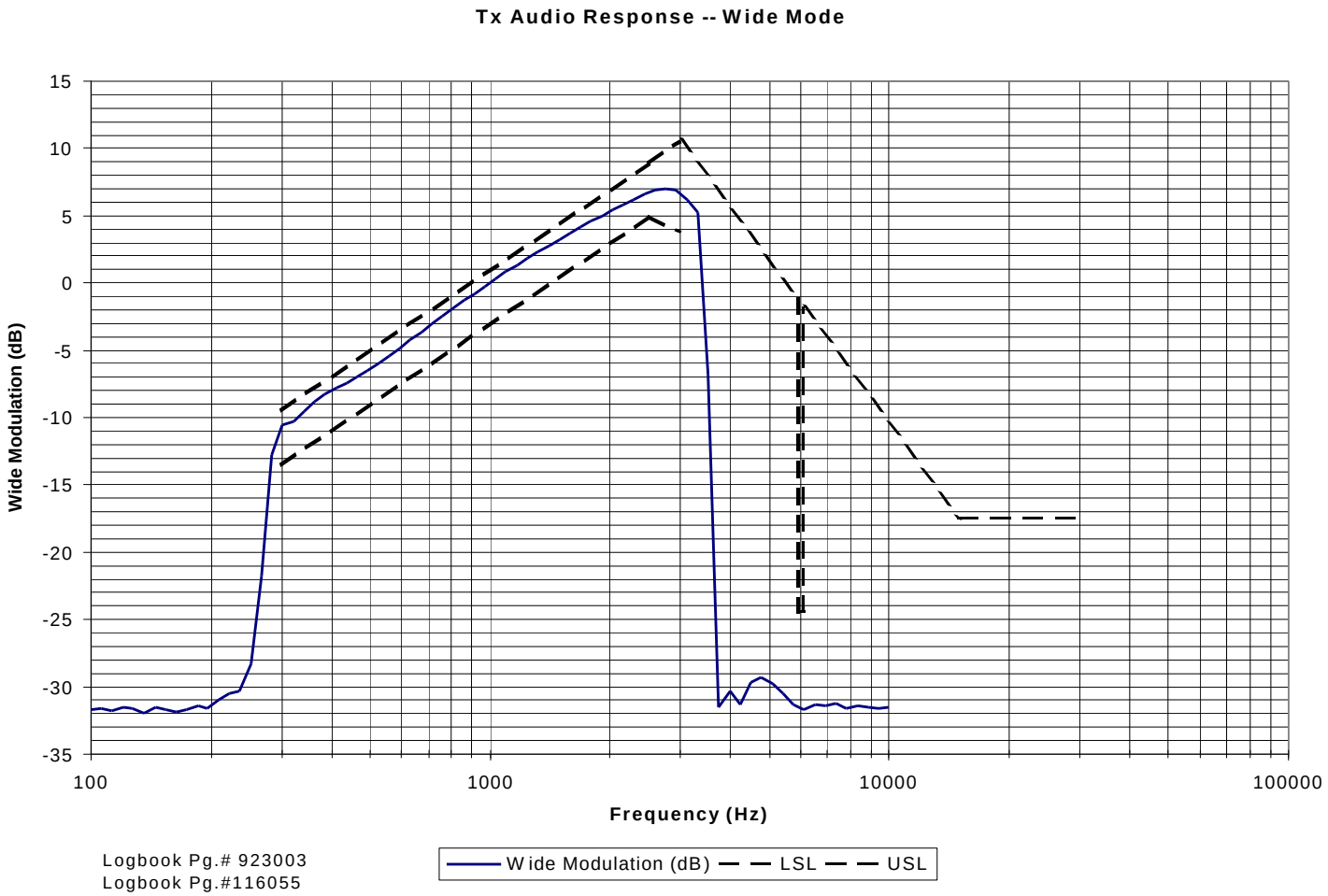
EFFECTIVE RADIATED POWER

Since the unit is intended for use with a provided antenna (and "non standard" RF connector), ERP is measured. The dipole antenna substitution method was used. The result indicated is the maximum ERP found over the channels and radio orientations tested.

Maximum Effective Radiated Power: Analog Mode 25.5 dBm (0.355 W)

Maximum Effective Radiated Power: 800 Digital CDMA Mode 23.8 dBm (0.240 W)

Maximum Effective Isotropic Radiated Power: 1900 Digital CDMA Mode 24.9 dBm (0.310 W)

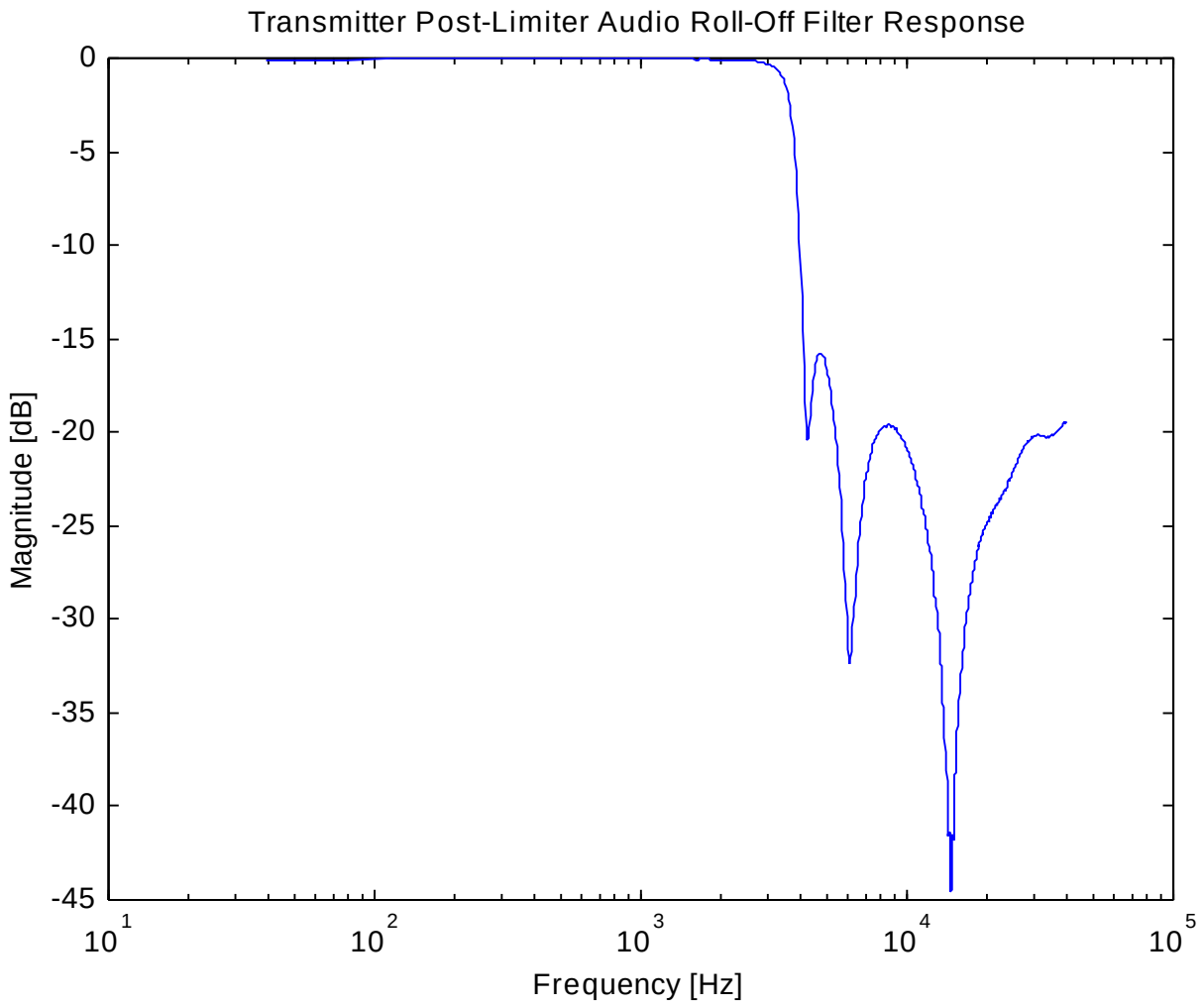


Logbook Pg.# 923003
Logbook Pg.#116055

POST LIMITER LOW PASS FILTER RESPONSE -GRAPH

Signature:

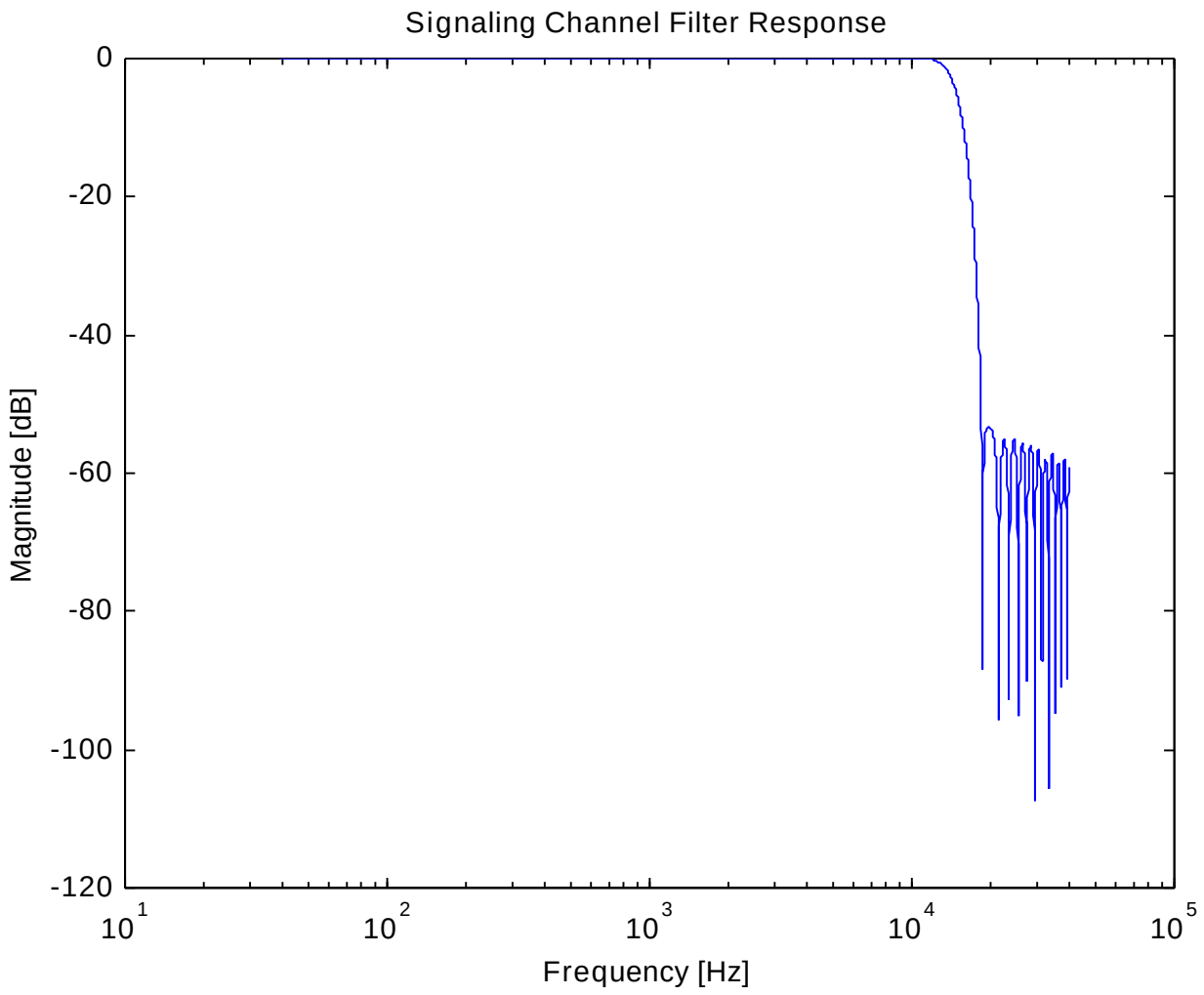
Date:

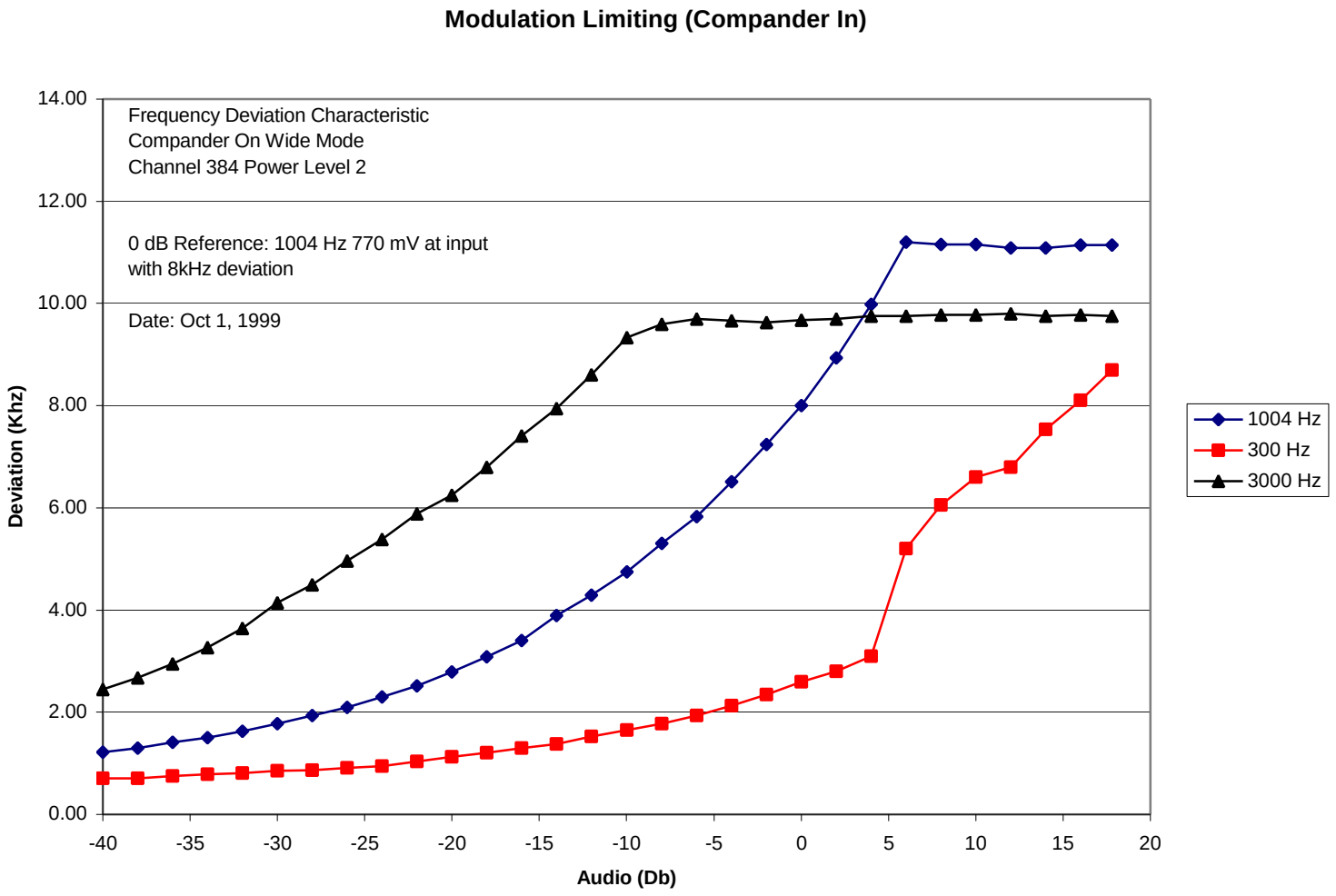


SIGNALING CHANNEL AUDIO ROLL-OFF FILTER RESPONSE - GRAPH

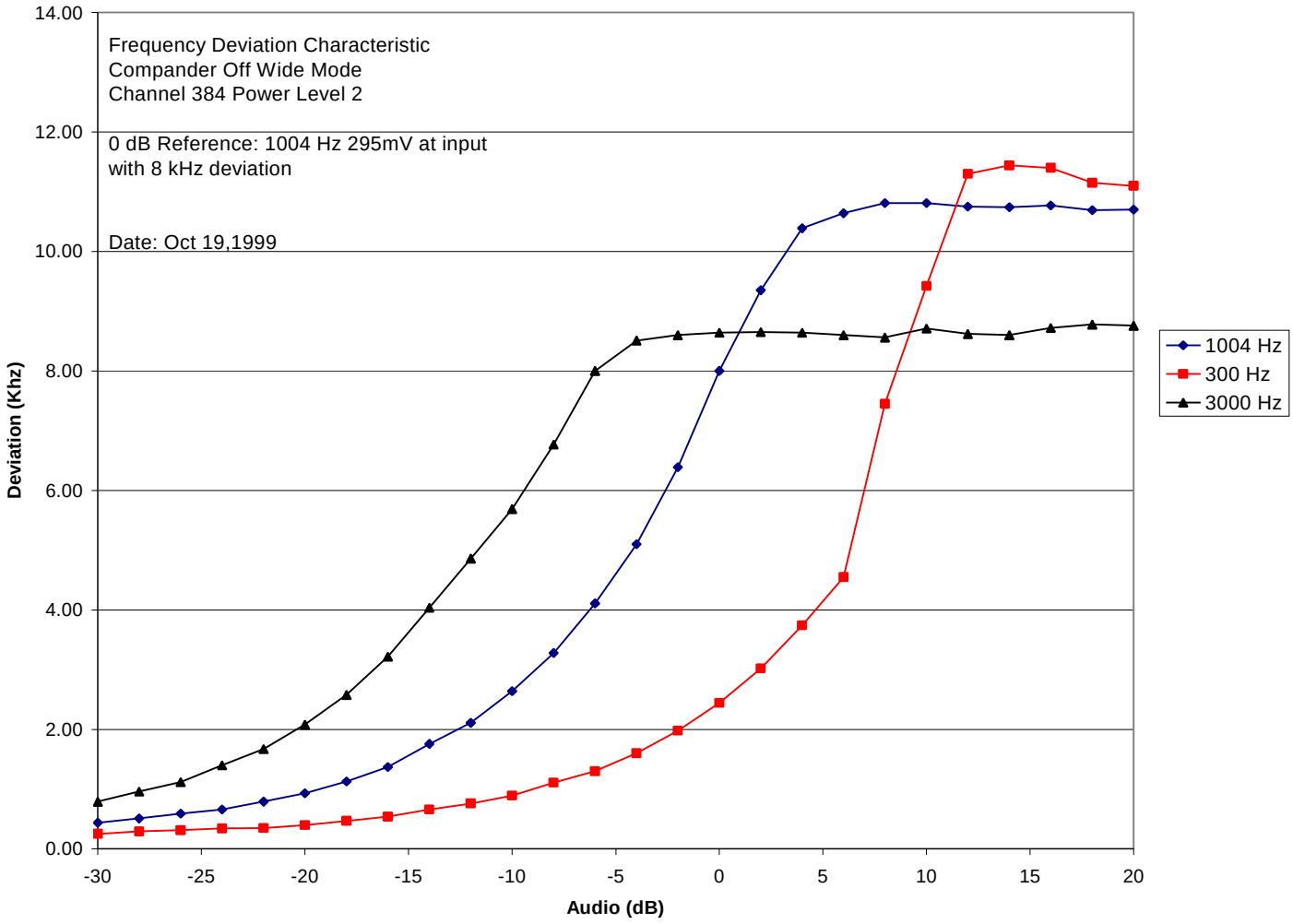
Signature:

Date:




Modulation Limiting (Compander In)
Frequency Deviation Characteristic
Compander On Wide Mode
Channel 384 Power Level 2
0 dB Reference: 1004 Hz 770 mV at input
with 8kHz deviation
Date: Oct 1, 1999
Deviation (Khz)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-40
-35
-30
-25
-20
-15
-10
-5
0
5
10
15
20
Audio (Db)
1004 Hz
300 Hz
3000 Hz

Modulation Limiting (Compandor Out)



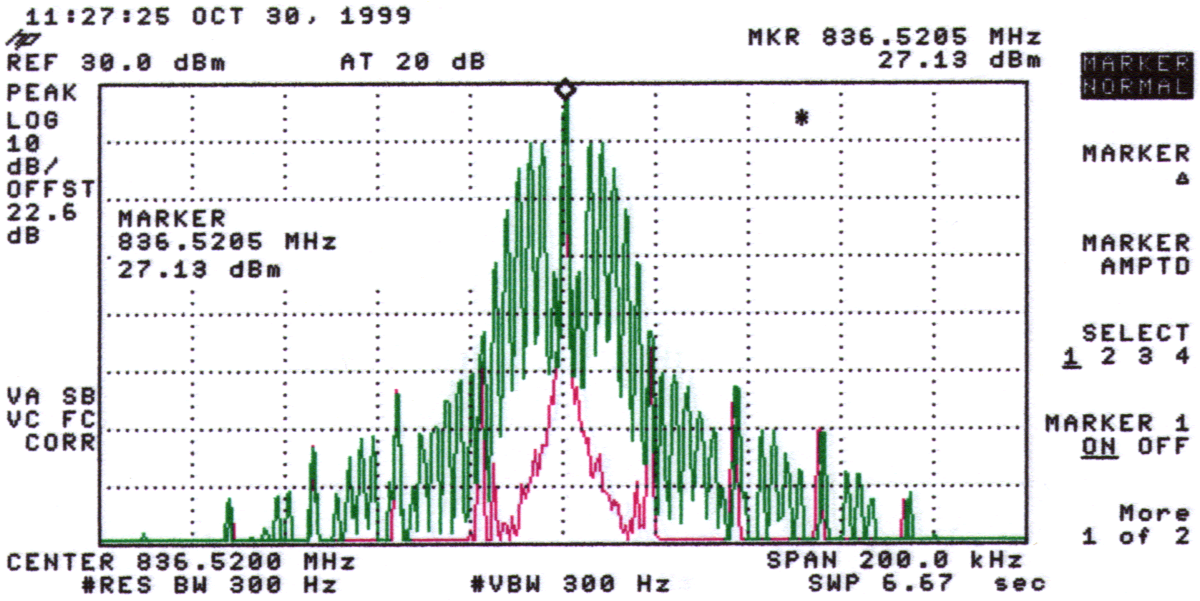
BANDWIDTH MEASUREMENT DATA FOR TRANSMITTER TYPES F8W

DEVIATION OF THE CARRIER WITH 2500 Hz. AUDIO MODULATION

HORIZONTAL SCALE = 20 kHz / DIVISION
VERTICAL SCALE = 10 dB / DIVISION (REFERENCE LEVEL = 30dBm)
RESOLUTION BANDWIDTH =300 Hz
VIDEO BANDWIDTH =300 Hz
AUDIO LEVEL = 16 dB GREATER THAN LEVEL REQUIRED TO PRODUCE + / - 6 kHz
POWER LEVEL = 0.516W

MEASURED DATA:

1. Instantaneous Deviation Control set for a maximum of +/- 12 kHz
2. Tune and adjust to obtain unmodulated carrier on the spectrum analyzer. Save trace of the unmodulated carrier.
3. Modulate the transmitter with the 2500 Hz. 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 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 63 + 10 log10 (mean output power in Watts) dB, whichever is the smaller attenuation

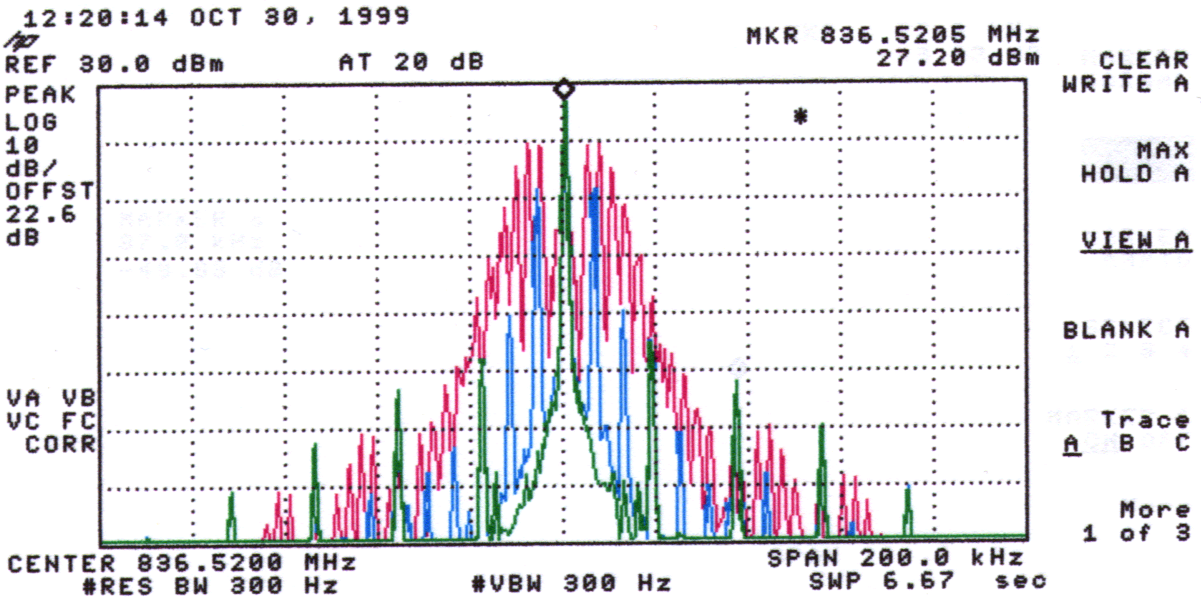
BANDWIDTH MEASUREMENT DATA FOR TRANSMITTER TYPES F8W

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

HORIZONTAL SCALE = 20 kHz / DIVISION
VERTICAL SCALE = 10 dB / DIVISION (REFERENCE LEVEL = 30dBm)
RESOLUTION BANDWIDTH = 300 Hz
VIDEO BANDWIDTH = 300 Hz
POWER LEVEL = 0.524W

MEASURED DATA:

1. Instantaneous Deviation Control set for a maximum of +/- 12 kHz
2. Tune and adjust to obtain the unmodulated carrier on the spectrum analyzer. Save trace of the unmodulated carrier.
3. Modulate the transmitter with signaling tone and 2500 Hz tone, 16 dB greater than that required to produce +/- 6kHz of deviation add SAT with +/- 2kHz of 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.

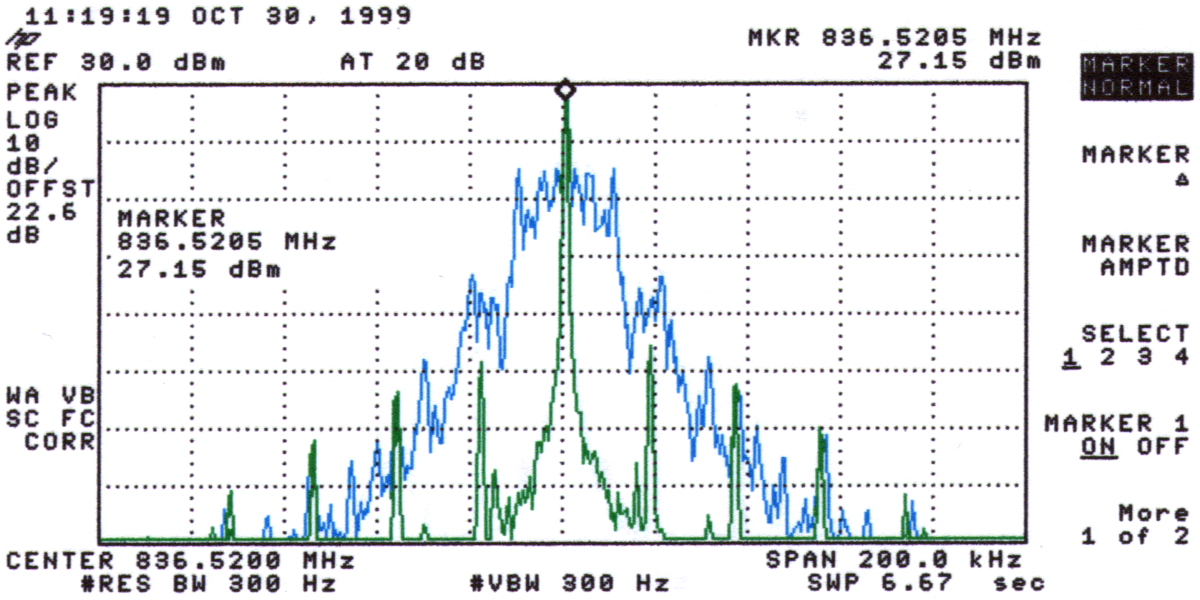
b. On any frequency removed from the assigned carrier frequency by more than 45 kHz, up to the first multiple of the carrier frequency, the sideband is at least 60 dB below the carrier or 63 + 10 log10 (mean output power in Watts) dB, whichever is the smaller attenuation.

BANDWIDTH MEASUREMENT DATA FOR TRANSMITTER TYPES F1D

DEVIATION OF THE CARRIER WITH WIDE BAND DATA
HORIZONTAL SCALE = 20 kHz / DIVISION
VERTICAL SCALE = 10 dB / DIVISION (REFERENCE LEVEL = 30dBm)
RESOLUTION BANDWIDTH = 300 Hz
VIDEO BANDWIDTH = 300 Hz
POWER LEVEL = 0.518W

MEASURED DATA:

1. Instantaneous Deviation Control set for a maximum of +/- 12 kHz
2. Tune and adjust to obtain the unmodulated carrier on the spectrum analyzer. Save trace of the unmodulated carrier.
3. Modulate the transmitter with wide band data with +/- 8 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 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.

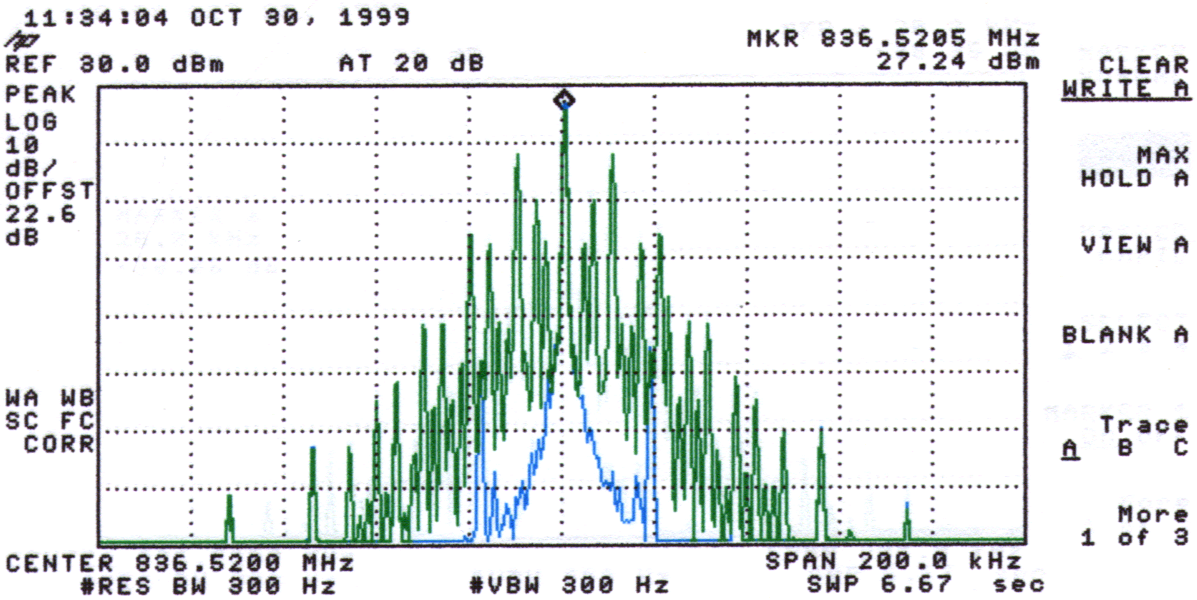
c. On any frequency removed from the assigned carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency, the sideband is at least 60 dB below the carrier or 63+10 log10 (mean output power in Watts) dB, whichever is the smaller attenuation.

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 (REFERENCE LEVEL = 30dBm)
RESOLUTION BANDWIDTH = 300 Hz
VIDEO BANDWIDTH = 300 Hz
POWER LEVEL = 0.530W

MEASURED DATA:

1. Instantaneous Deviation Control set for a maximum of +/- 12 kHz
2. Tune and adjust to obtain the unmodulated carrier on the spectrum analyzer. Save trace of the unmodulated carrier.
3. Modulate the transmitter with signaling tone with +/- 8 kHz deviation and add SAT with +/- 2kHz of 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 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 63+10 log10 (mean output power in Watts) dB, whichever is the smaller attenuation.

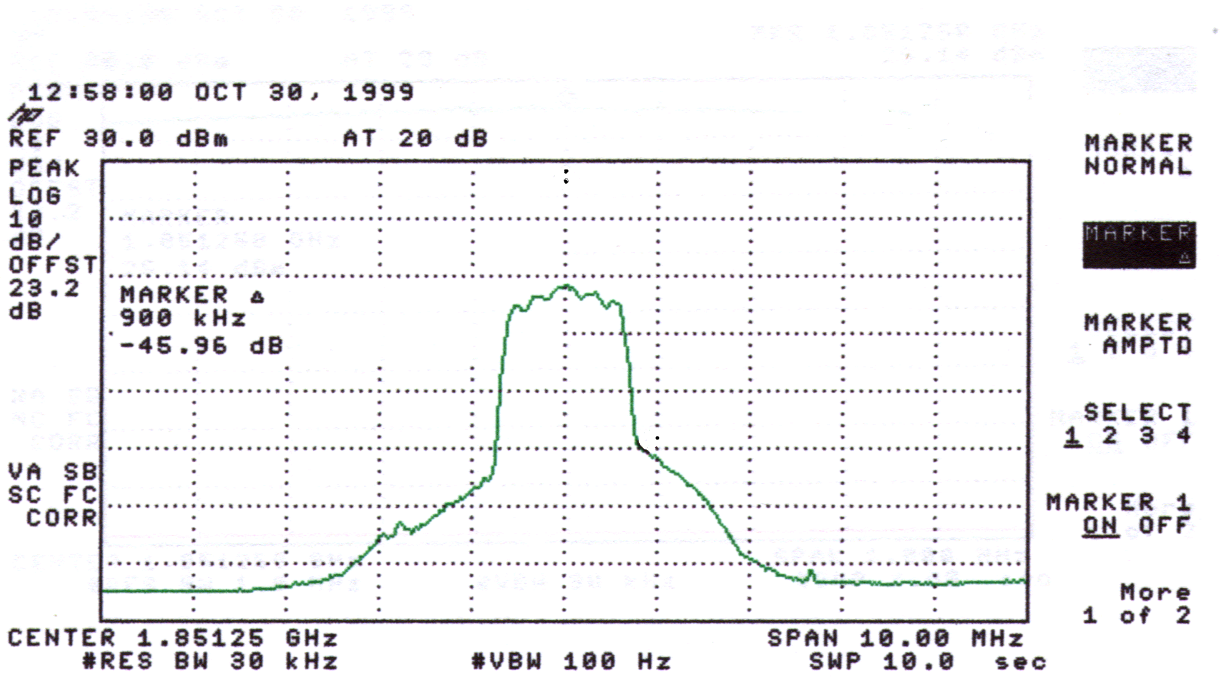
BANDWIDTH MEASUREMENT DATA FOR TRANSMITTER TYPES F9W

DEVIATION OF THE CARRIER WITH OQPSK MODULATION

HORIZONTAL SCALE = 1MHz / DIVISION
VERTICAL SCALE = 10 dB / DIVISION (ATTENUATION)
RESOLUTION BANDWIDTH = 30 kHz
VIDEO BANDWIDTH = 100 Hz
POWER LEVEL = 0.326W (Average Power in transmitter)

MEASURED DATA:

1. Modulate the transmitter with OQPSK modulation, using pseudo random data. Obtain image on spectrum analyzer.



COMMENTS:

Modulation products in a bandwidth of 30 kHz ,centered +/- 900 kHz from the channel center frequency should be at least 45 dB and should be at least 42 dB below the mean output power level.

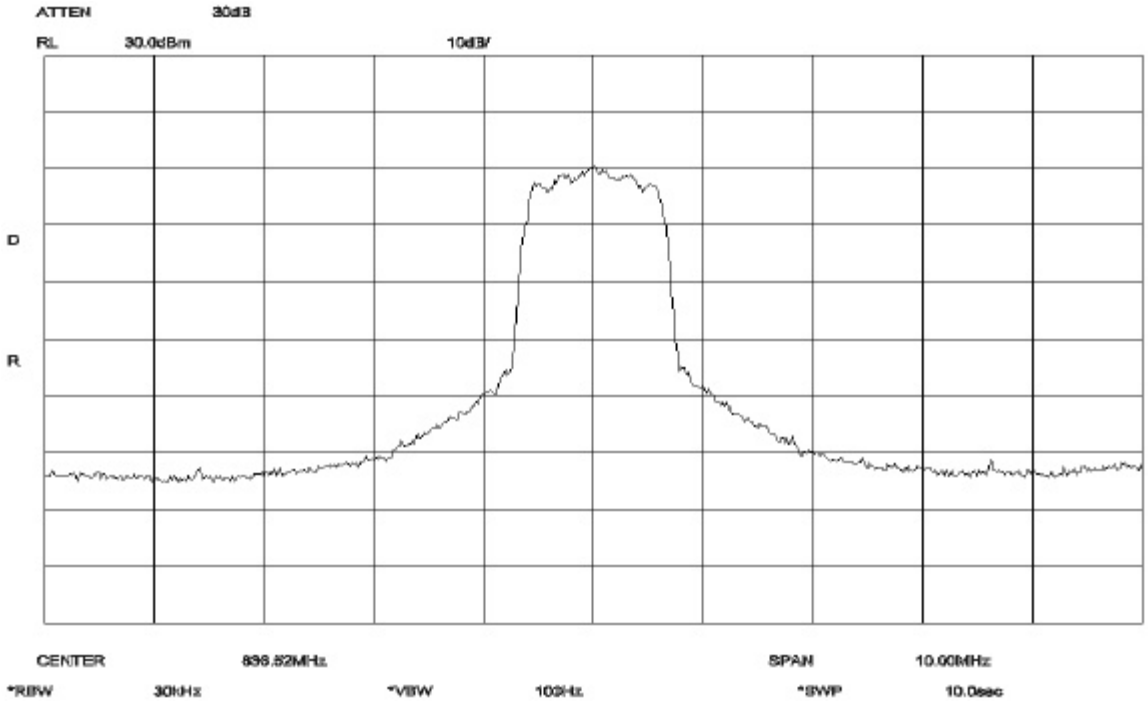
BANDWIDTH MEASUREMENT DATA FOR TRANSMITTER TYPES F9W

DEVIATION OF THE CARRIER WITH OQPSK MODULATION

HORIZONTAL SCALE = 1MHz / DIVISION
VERTICAL SCALE = 10 dB / DIVISION (ATTENUATION)
RESOLUTION BANDWIDTH = 30 kHz
VIDEO BANDWIDTH = 100 Hz
POWER LEVEL = 0.316W (Average Power in transmitter)

MEASURED DATA:

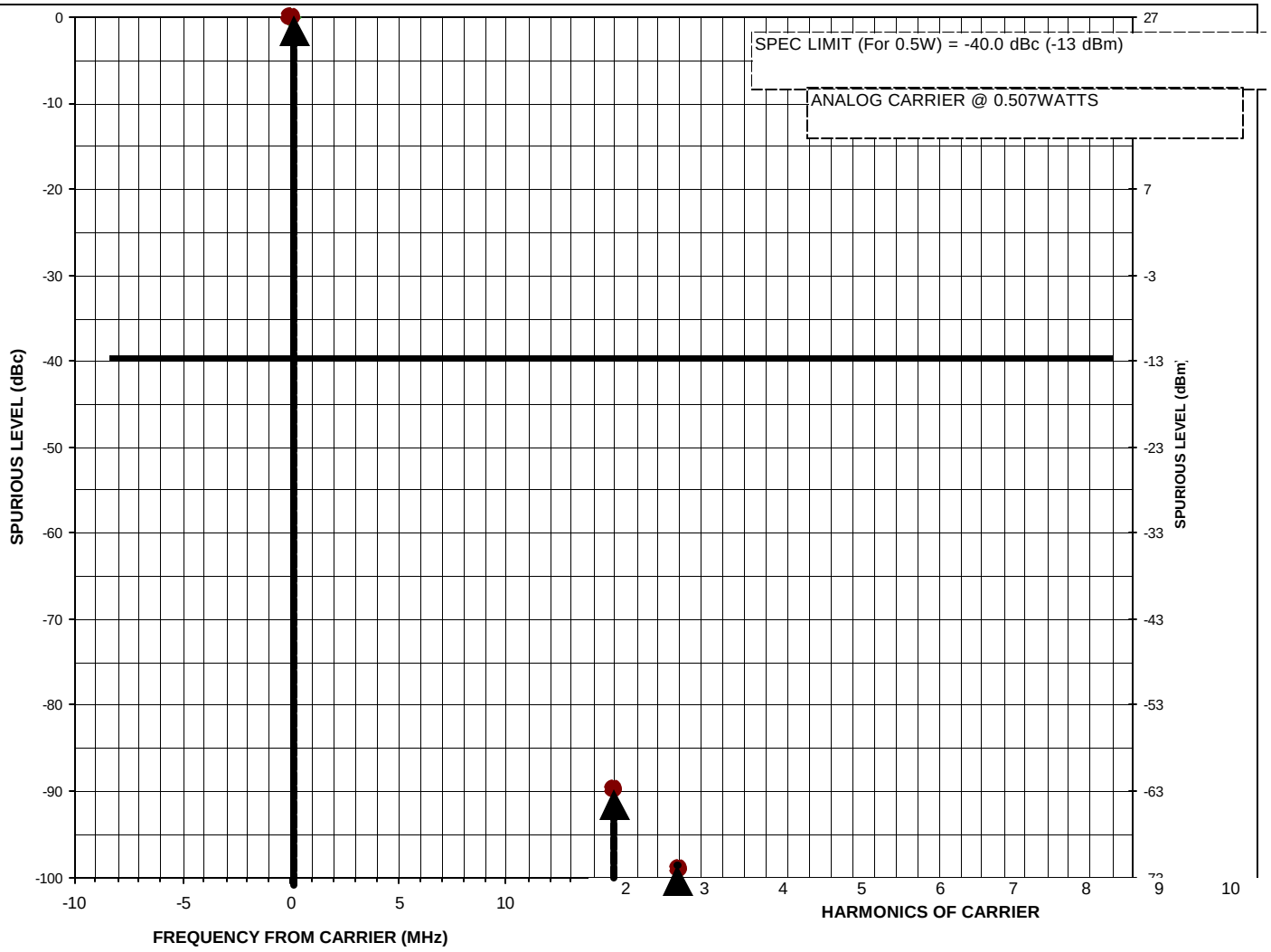
1. Modulate the transmitter with OQPSK modulation, using pseudo random data. Obtain image on spectrum analyzer.



COMMENTS:

Modulation products in a bandwidth of 30 kHz ,centered +/- 900 kHz from the channel center frequency should be at least 45 dB and should be at least 42 dB below the mean output power level.

ANALOG CONDUCTED SPURIOUS AND HARMONIC EMISSIONS - GRAPH

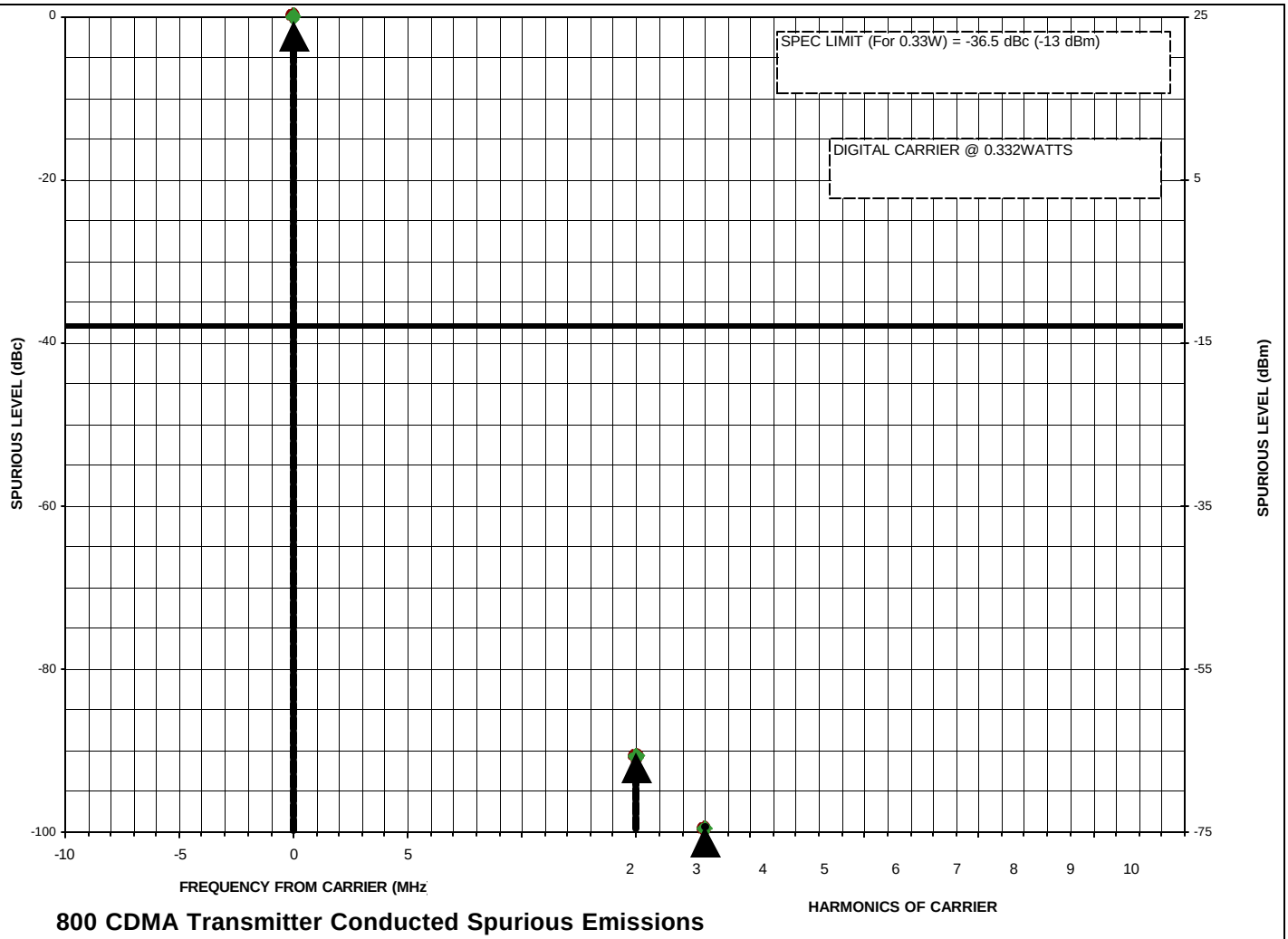


Analog Transmitter Conducted Spurious Emissions

Carrier Power: 0.51 W to 4.8 mW in 4 dB steps.
Carrier Frequency: 824.01 to 848.99 MHz in 10 kHz steps
* Each reported emission reflects the highest absolute level found among all power levels, channels, power amplifier configurations tested.
* All emissions not reported are more than 20 dB below the FCC specification
* No signals greater than -80 dBm were found in the 869 to 894 MHz band

* Spectrum was searched from 30 kHz to the 10th Harmonic of the transmitter

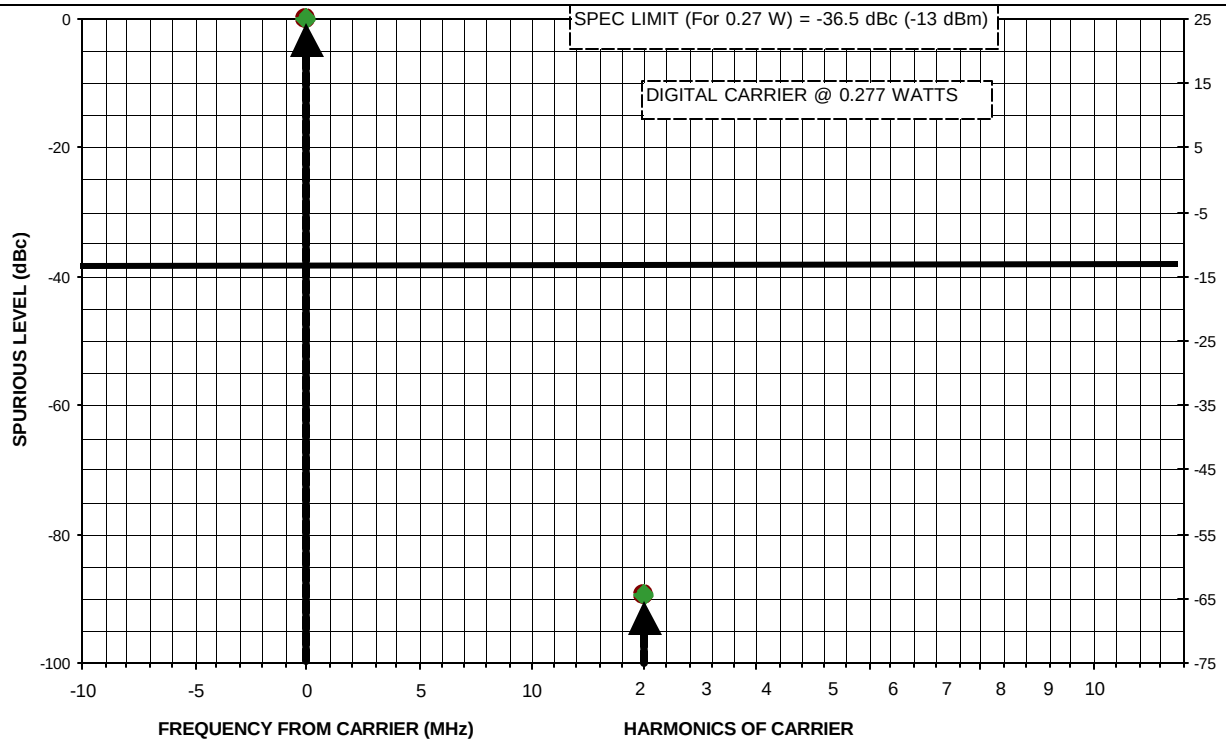
800 CDMA CONDUCTED SPURIOUS AND HARMONIC EMISSIONS - GRAPH



800 CDMA Transmitter Conducted Spurious Emissions

Carrier Power: 0.33W to 0.00001 mW.
Carrier Frequency: 1851.25 to 1908.75 MHz in 50KHz steps
* Each reported emission reflects the highest absolute level found among all power levels, channels, power amplifier configurations tested.
* All emissions not reported are more than 20 dB below the FCC specification
* No signals greater than -80 dBm were found in the 1930 to 1990 MHz band
* Spectrum was searched from 30 kHz to the 10th Harmonic of the transmitter

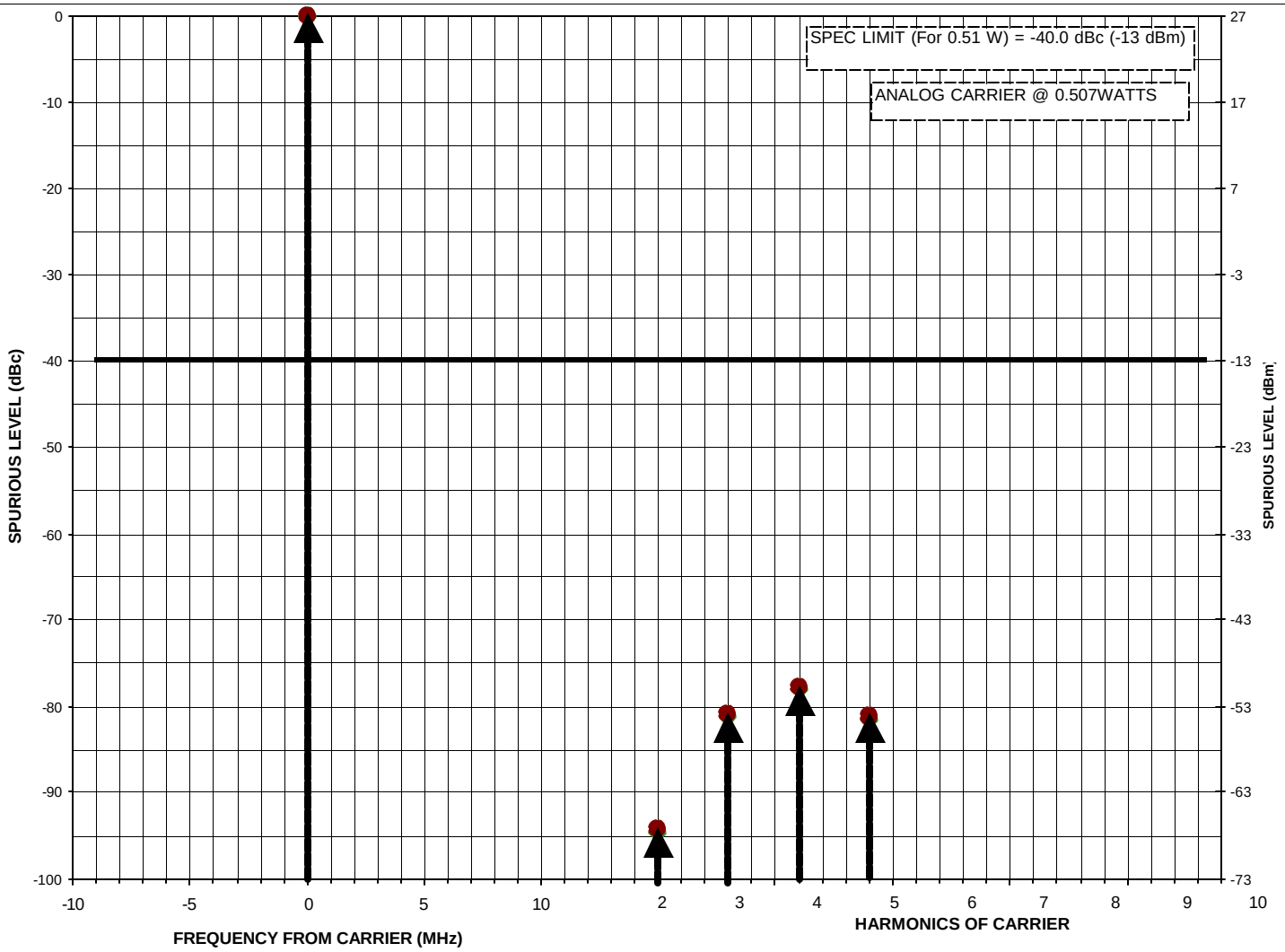
1900 CDMA CONDUCTED SPURIOUS AND HARMONIC EMISSIONS-GRAPH



1900 CDMA Transmitter Conducted Spurious Emissions

Carrier Power: 0.27 W to 0.00001 mW.
Carrier Frequency: 1851.25 to 1908.75 MHz in 50 KHz steps
* Each reported emission reflects the highest absolute level found among all power levels, channels, power amplifier configurations tested.
* All emissions not reported are more than 20 dB below the FCC specification
* No signals greater than -80 dBm were found in the 1930 to 1990 MHz band
* Spectrum was searched from 30 kHz to the 10th Harmonic of the transmitter

ANALOG RADIATED SPURIOUS AND HARMONIC EMISSIONS - GRAPH

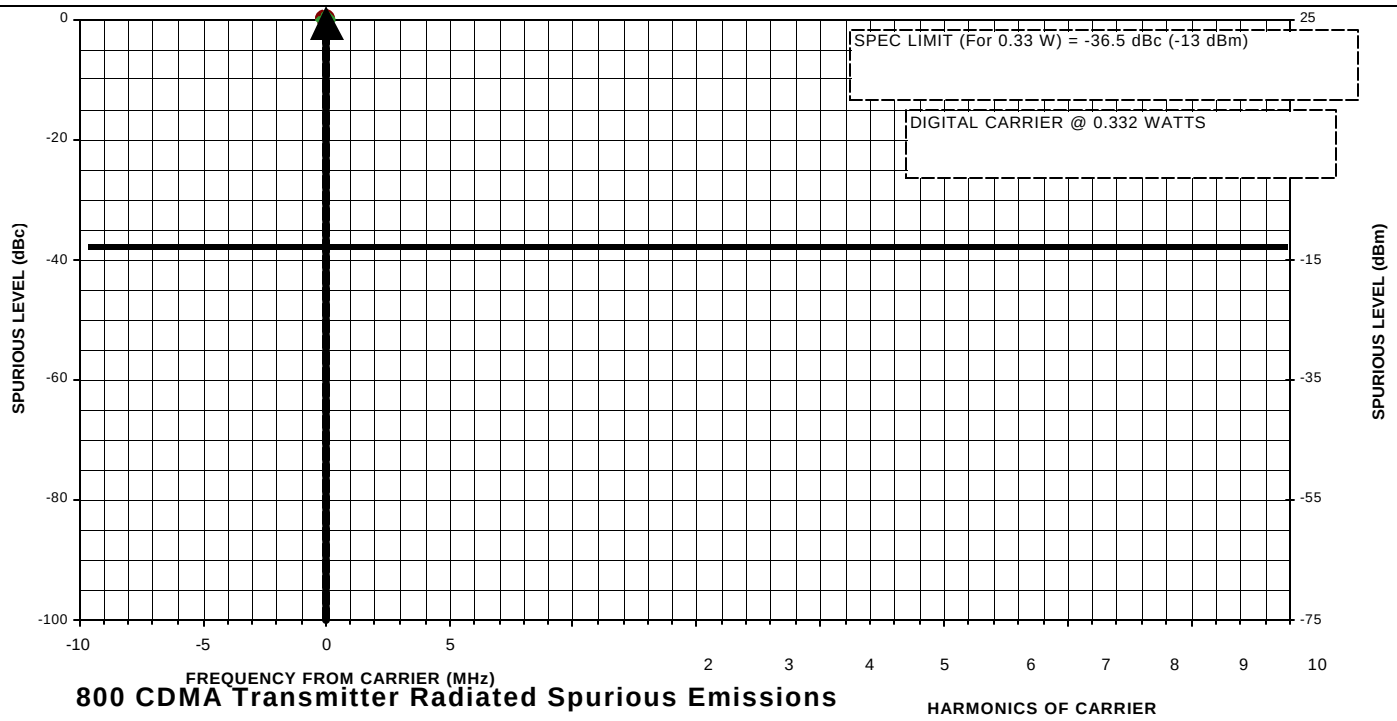


Analog Transmitter Radiated Spurious Emissions

Carrier Power: 0.51 W to 4.8 mW in 4 dB steps.
Carrier Frequency: 824.01 to 848.99 MHz in 10 kHz steps
* Each reported emission reflects the highest absolute level found among all power levels, channels, power amplifier configurations tested.
* All emissions not reported are more than 20 dB below the FCC specification
* No signals greater than -80 dBm were found in the 869 to 894 MHz band

* Spectrum was searched from 30 kHz to the 10th Harmonic of the transmitter

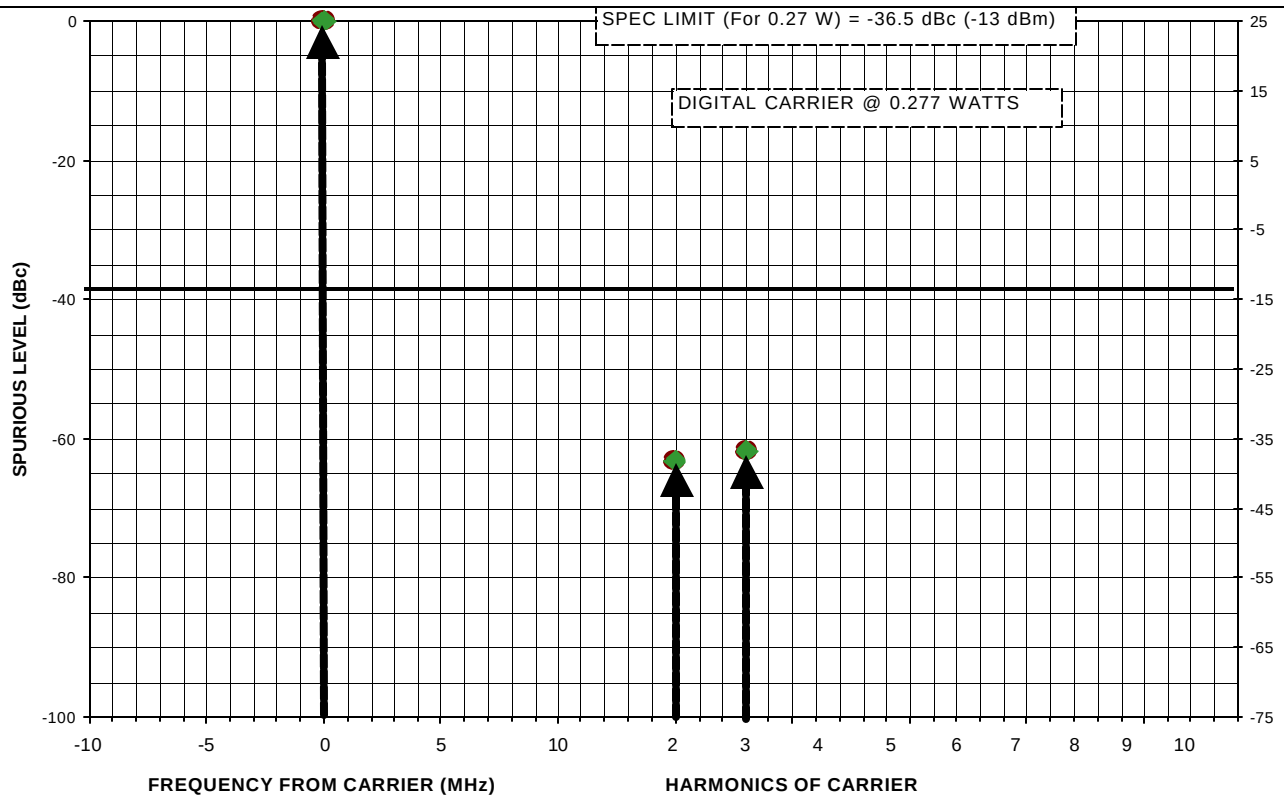
800 CDMA RADIATED SPURIOUS AND HARMONIC EMISSIONS - GRAPH



800 CDMA Transmitter Radiated Spurious Emissions

Carrier Power: 0.33W to 0.00001 mW.
Carrier Frequency: 1851.25 to 1908.75 MHz in 50KHz steps
* Each reported emission reflects the highest absolute level found among all power levels, channels, power amplifier configurations tested.
* All emissions not reported are more than 20 dB below the FCC specification
* No signals greater than -80 dBm were found in the 1930 to 1990 MHz band
* Spectrum was searched from 30 kHz to the 10th Harmonic of the transmitter

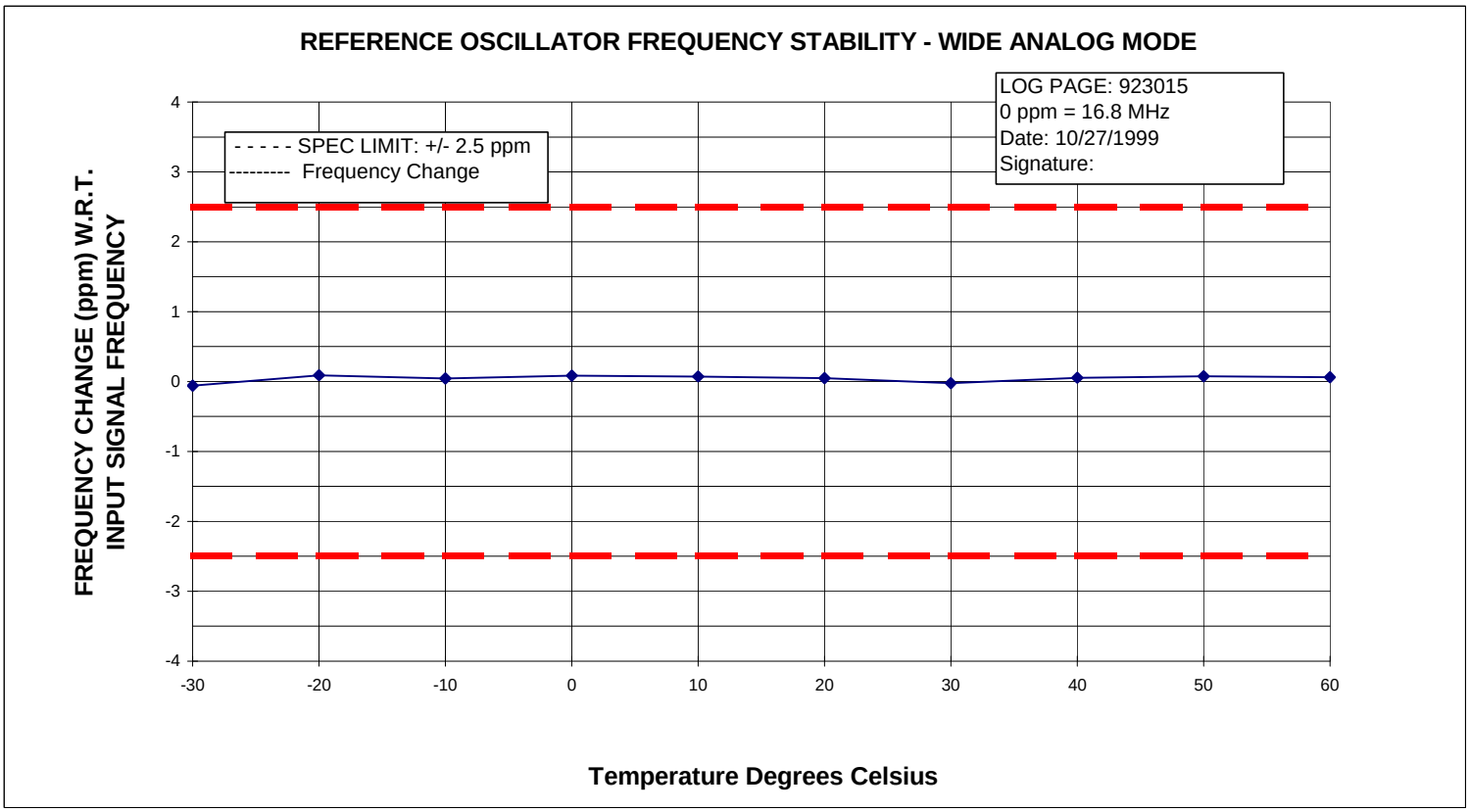
1900 CDMA RADIATED SPURIOUS AND HARMONIC EMISSIONS-GRAPH



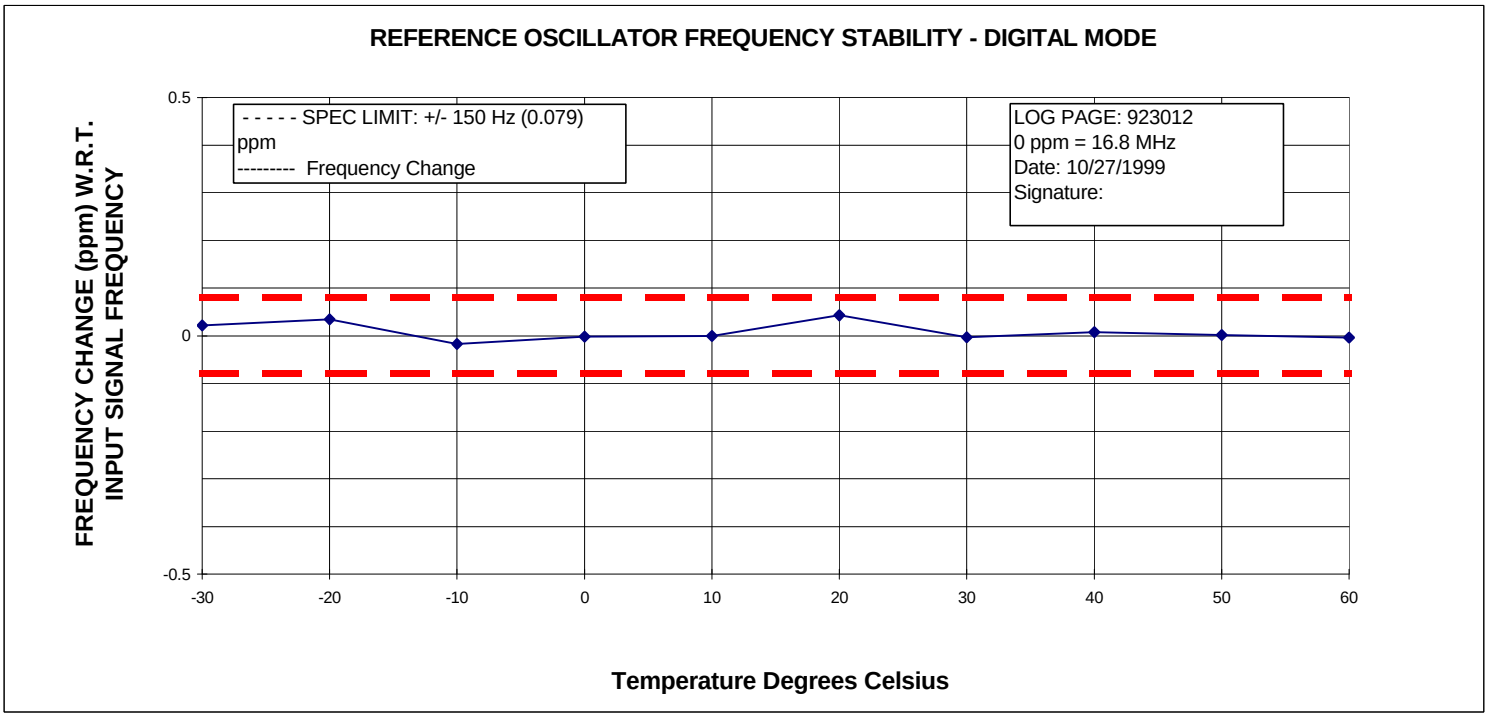
1900 CDMA Transmitter Radiated Spurious Emissions

Carrier Power: 0.27 W to 0.00001 mW.
Carrier Frequency: 1851.25 to 1908.75 MHz in 50 KHz steps
* Each reported emission reflects the highest absolute level found among all power levels, channels, power amplifier configurations tested.
* All emissions not reported are more than 20 dB below the FCC specification
* No signals greater than -80 dBm were found in the 1930 to 1990 MHz band
* Spectrum was searched from 30 kHz to the 10th Harmonic of the transmitter

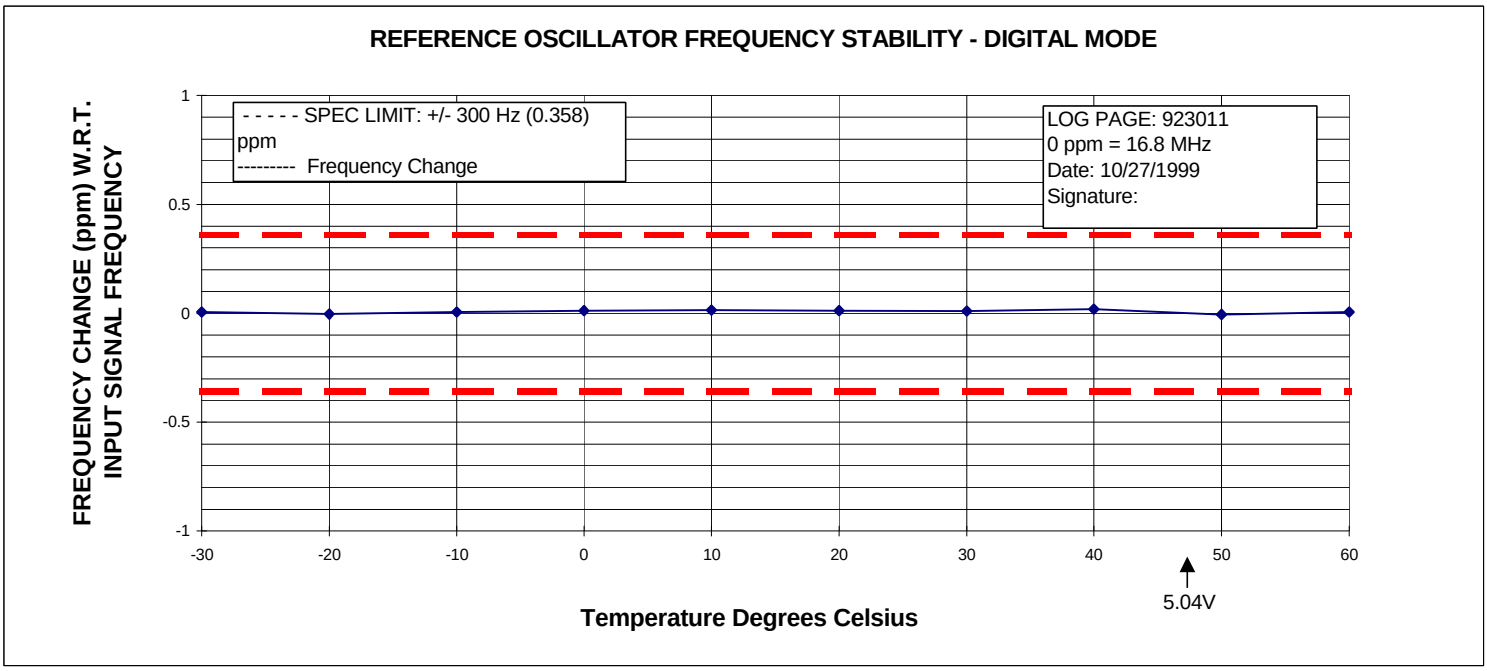
Frequency Change vs. Temperature (Amps)-Graph



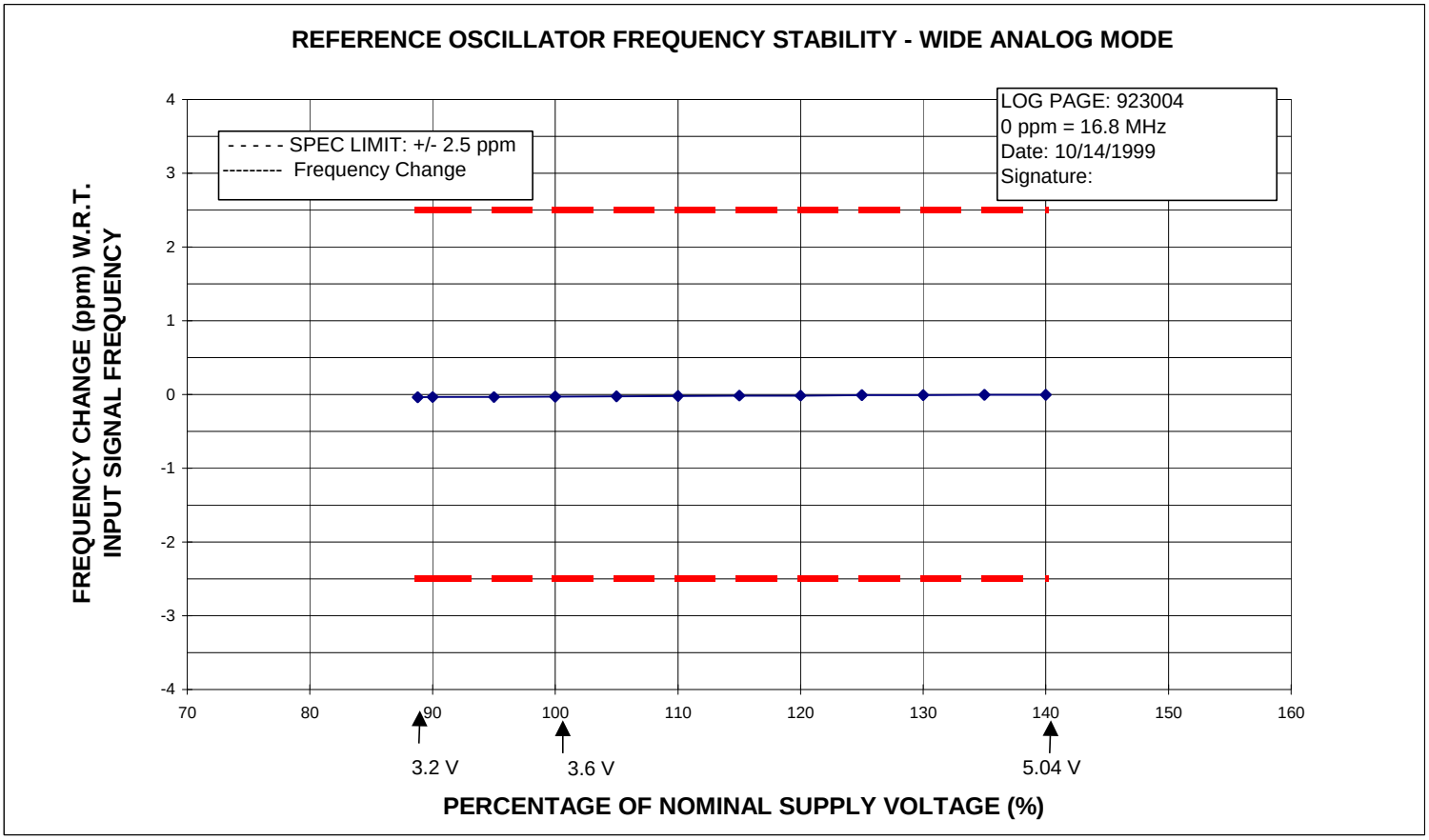
Frequency Change vs. Temperature (Digital 1900 CDMA)-Graph



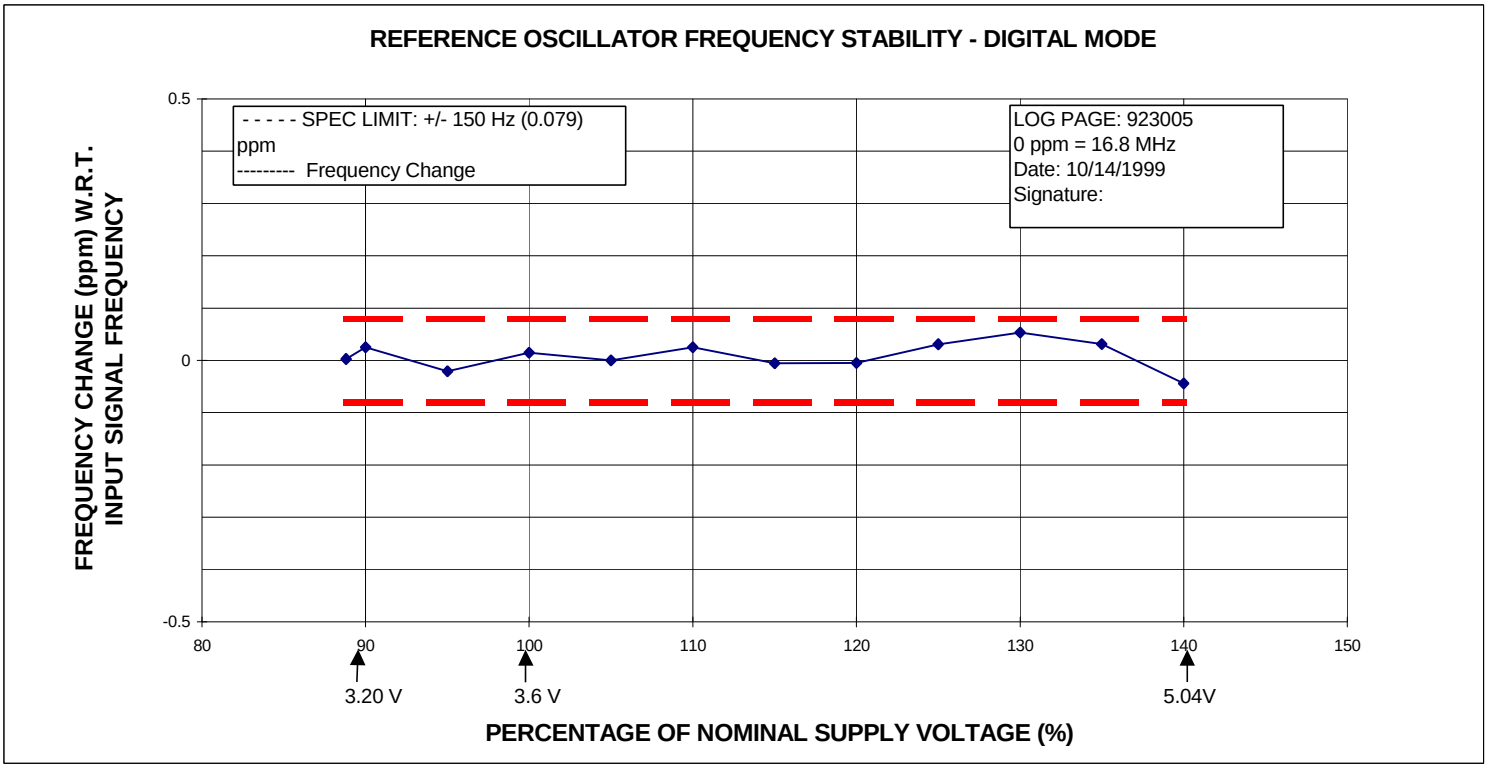
Frequency Change vs. Temperature (Digital 800 CDMA)-Graph



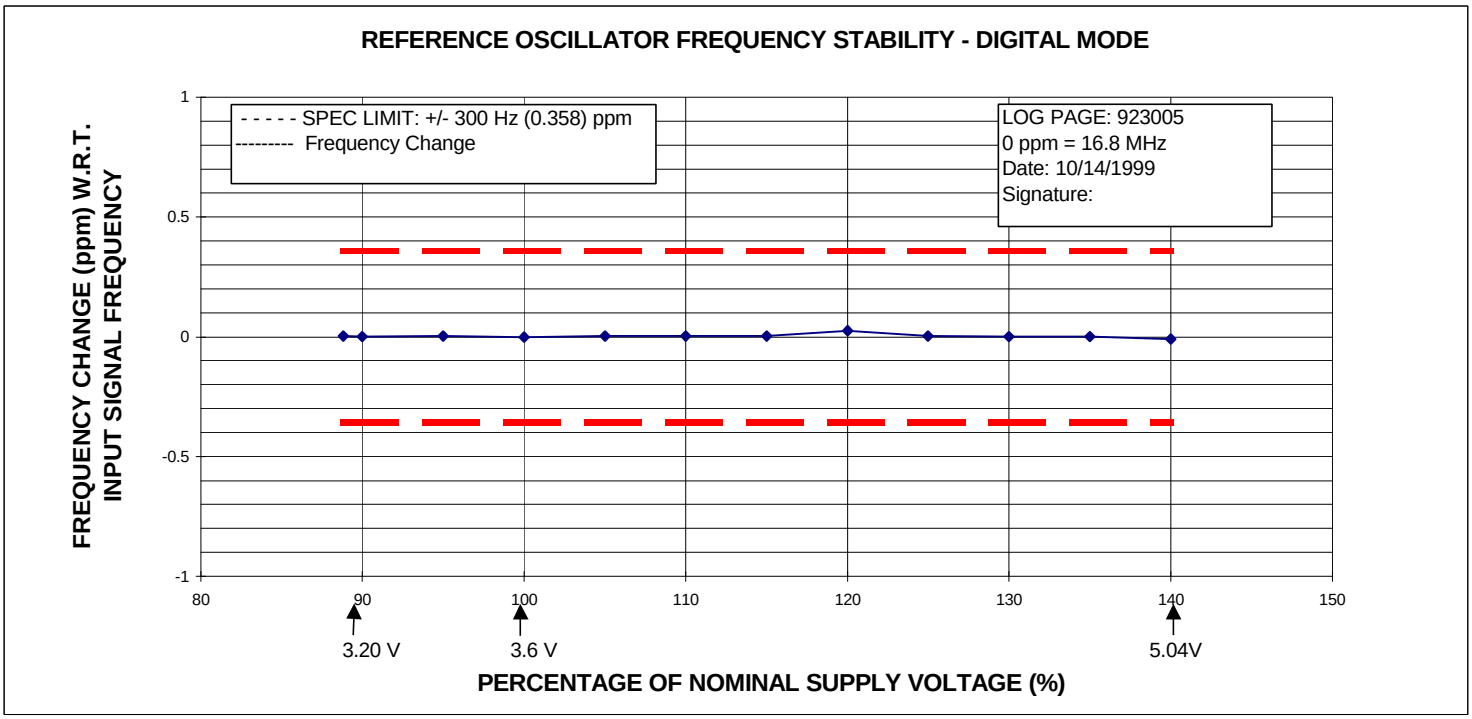
Frequency Change vs. Supply Voltage (Amps)-Graph



Frequency Change vs. Supply Voltage (Digital Mode 1900)-Graph



Frequency Change vs. Supply Voltage (Digital Mode 800 Mhz)-Graph



MEASUREMENT TECHNIQUES

2.991 Measurements Required: Conducted Spurious and Harmonic Emissions at Antenna Terminals (Analog Mode)

Graph attached
EXHIBIT 6G1

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 43dB 10 Log10(the mean power output). In the range of frequencies between 869.04MHz and 893.97MHz, and from 1930 MHz to 1990 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 1MHz 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 6G2 and 6G3

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 43dB 10 Log10(the mean power output). In the range of frequencies between 869.04MHz and 893.97MHz, and from 1930 MHz to 1990 MHz, no spur shall exceed -80dBm.

Method of Measurement - The transmitter was modulated with OQPSK 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 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 1MHz for signature scans, and then reduced to 30 kHz to measure individual signal strengths.

2.993 Measurements Required: Radiated Spurious and Harmonic Radiation (Analog and Digital Modes)

Graph attached
EXHIBIT 6H1, 6H2 and 6H3

Definition - Radiated spurious and harmonic emissions are frequencies from the equipment when loaded into a non-radiating load on 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 the information being transmitted.

Minimum standard - Radiated spurious emissions and harmonic emissions shall be attenuated 43dB 10 Log10(the mean power output). In the range of frequencies between 869.04MHz and 893.97MHz, and from 1930 MHz to 1990 MHz, no spur shall exceed -80dBm.

Method of Measurement:

Test Site - Schaumburg, Illinois, a region which is reasonably free from RF interference. A non-metallic building has been constructed to a special design which minimizes disturbances to RF radiation patterns. The building houses both the equipment under test and all the control and measurement equipment.

Installation of Equipment:

The equipment under test is placed on the turntable, connected to a dummy RF load, and then placed in normal operation using the intended power source. A receiving antenna located 3 meters from the turntable picks up any signal radiated from the transmitter and its operating accessories. The antenna is adjustable in height and can be horizontally and vertically polarized. Tunable receivers covering the necessary frequency range are used to detect and measure any radiation picked up by the antenna.

Measurement Procedure

The equipment is adjustable to obtain peak readings of received signals wherever they occur in the spectrum by:

1. Rotating the transmitter under test.

2. Adjusting the antenna height.

The testing procedure is repeated for both horizontal and vertical polarization of the receiving antenna. Relative signal strength is indicated on meters built into the receiver. To obtain actual radiated signal strength, a standard signal generator with calibrated output is substituted for the transmitter under test. The signal generator is adjusted in output until a reading identical to that obtained with the actual transmitter is obtained at the receiver. Signal strength is then read directly from the generator. Actual measurements are recorded on the attached graph.

2.995 Measurements Required: Frequency Stability (Analog and Digital Modes)

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

assigned carrier frequency.

Minimum standard - In the analog modes, the minimum frequency stability shall be ±0.000075% referenced to a received carrier frequency from a base station. This meets the requirement for operational accuracy of 0.00025% in wide mode and 0.00010% in narrow mode. In digital mode, the minimum frequency stability shall be ±300 Hz referenced to a received carrier frequency from a base station. This meets the requirement for operational accuracy of 0.00005% in digital mode.

Method of Measurement - Frequency measurements shall be made at the extremes of the temperature range -30° to +60°C 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. 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.

The frequency stability of transmitting equipment shall be checked with variations in:

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

Graphs attached EXHIBITS

(b) Primary Supply Voltage:

Vary the primary supply voltage over the specified battery voltage range.

Graphs attached EXHIBITS

Timing Period and Procedure for Frequency Stability Measurements

1. The carrier frequency of the transmitter was 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, measurement of the carrier frequency of the transmitter was made within a three minute interval after applying power to the transmitter.

4. Frequency measurements were made at each 10 ^{o}C interval (-30°, -20 ^{o}, -10 ^{o}, 0 ^{o}, +10 ^{o}, +20 ^{o}, +30 ^{o}, +40 ^{o}, +50 ^{o}, +60 ^{o}). A period of at least one hour was provided to allow stabilization of the equipment at each temperature level.

5. In all measurements, at the various temperature intervals, the temperature was held to ±1°C from the temperature level.

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