SUBMITTED MEASURED DATA

Measurement		Exhibit
1.	Index	8
2.	RF Power Out	8A
3.	Modulation Characteristics	
	a. Baseband Splatter Filter Response	8B
	b. Baseband Filtered Data	8C
	c. Demodulated RF Data (Deviation)	8D
4.	Occupied Bandwidth	
	A. NBPCS Emission Limits	8E
	B. SMR Emission Limits	8F
5.	Spurious Emissions at Antenna Terminals	
	A. Carrier Frequency at +/-50 kHz	8G
	B. Carrier Frequency at +/- 25 kHz	8H
	C. 9 kHz to 10 GHz	8I
5.	Transmitter Radiated Spurious	
	A. Vertical Polarization	8J
	B. Horizontal Polarization	8K
6.	Frequency Stability	
	a. Frequency Stability vs. Temperature	8L
	b. Frequency Stability vs. Supply Voltage	8M

SUBMITTED MEASURED DATA – RF POWER OUT

The conducted RF power output is measured at RF connector J830 with the transmitter adjusted in accordance with the tune-up procedure to give the value of voltage and current specified in Exhibit 3 as required by 2.983(d)5. The power measurement is made using a Hewlett Packard HP8991A Peak Power Analyzer with HP84815A Peak Power Sensor and a 20 dB attenuator.

The typical RF output power conducted into an antenna is +33 dBm. The plot of power vs. time for a 16 millisecond data packet transmission is shown below.

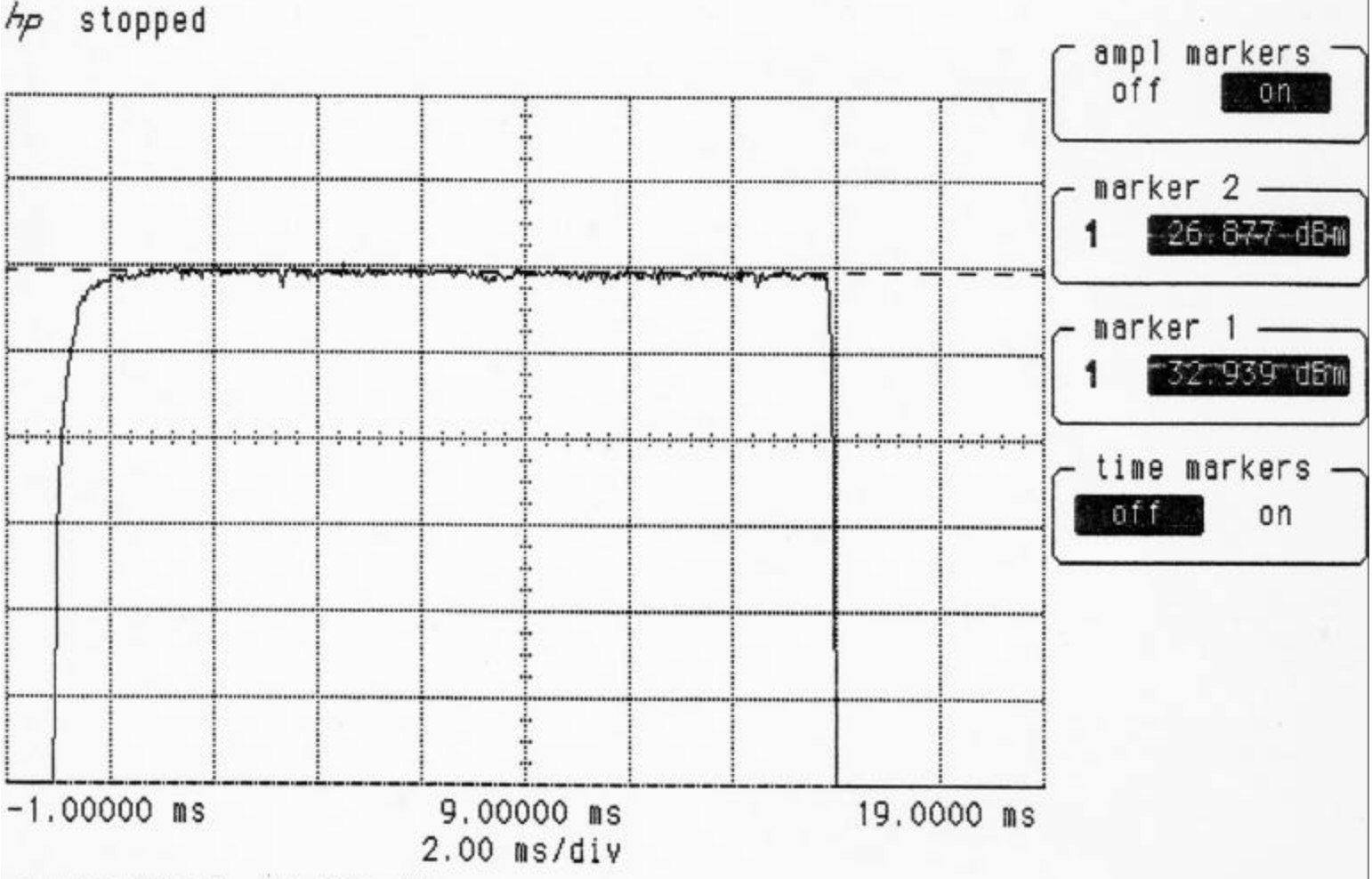


EXHIBIT 8A

SUBMITTED MEASURED DATA – SPLATTER FILTER RESPONSE

The baseband splatter filter response is shown below. It is a Guassian (GMSK) filter with BT = 0.54.

SUBMITTED MEASURED DATA – BASEBAND FILTERED DATA

The baseband filtered data plot is shown below. The data is a pseudo-random data stream generated by the DSP at 9600 bits per second.

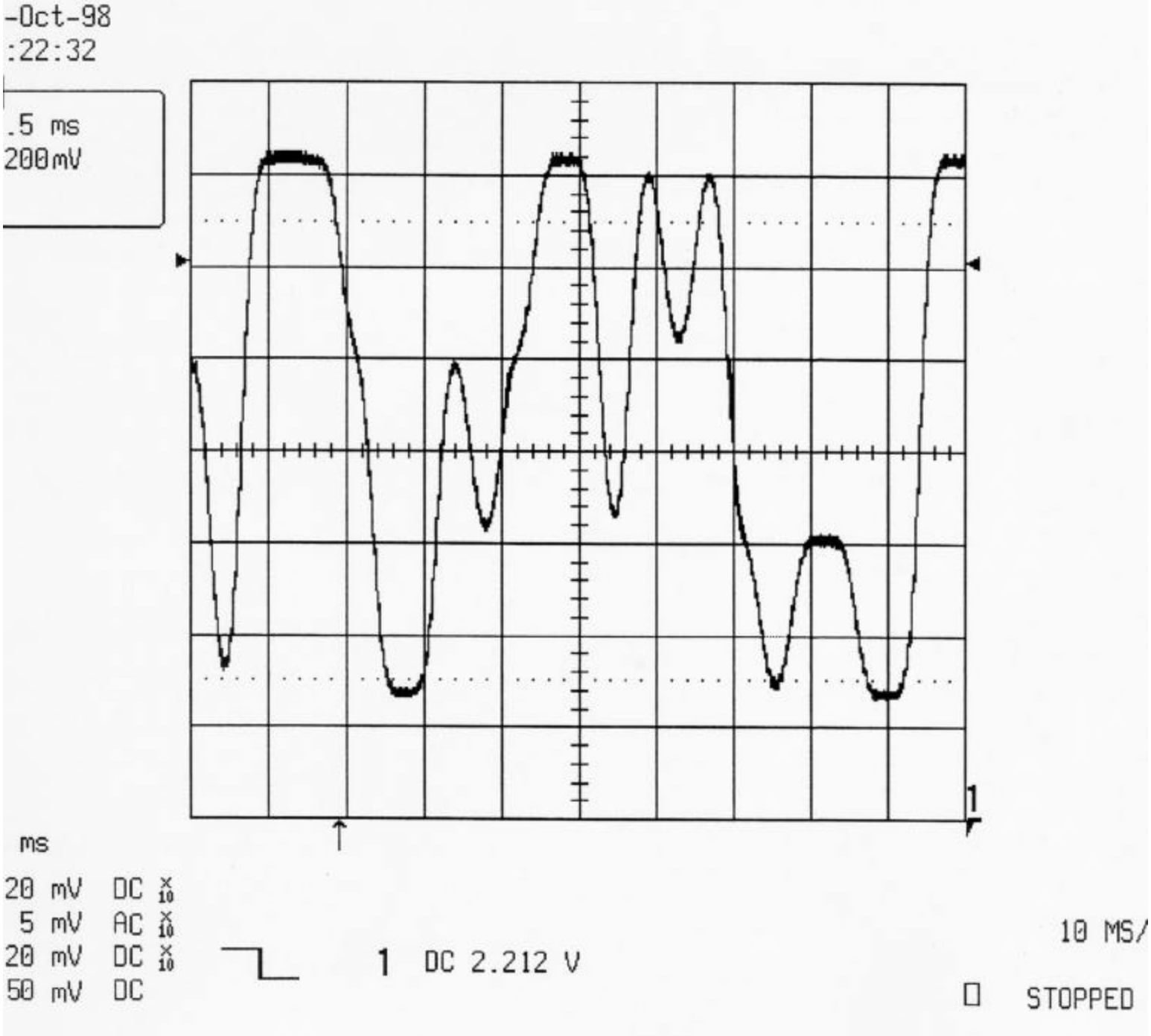
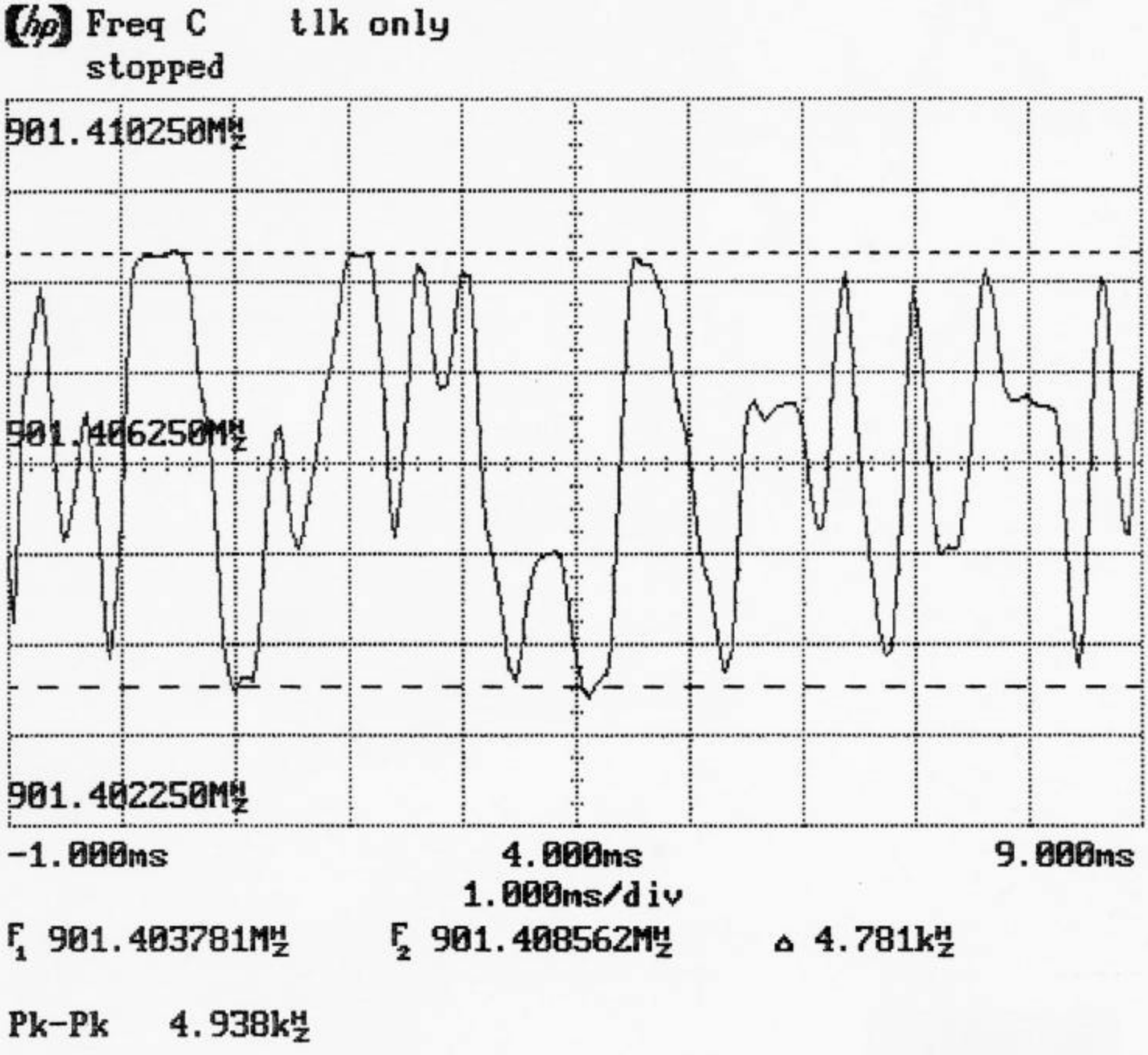


EXHIBIT 8C

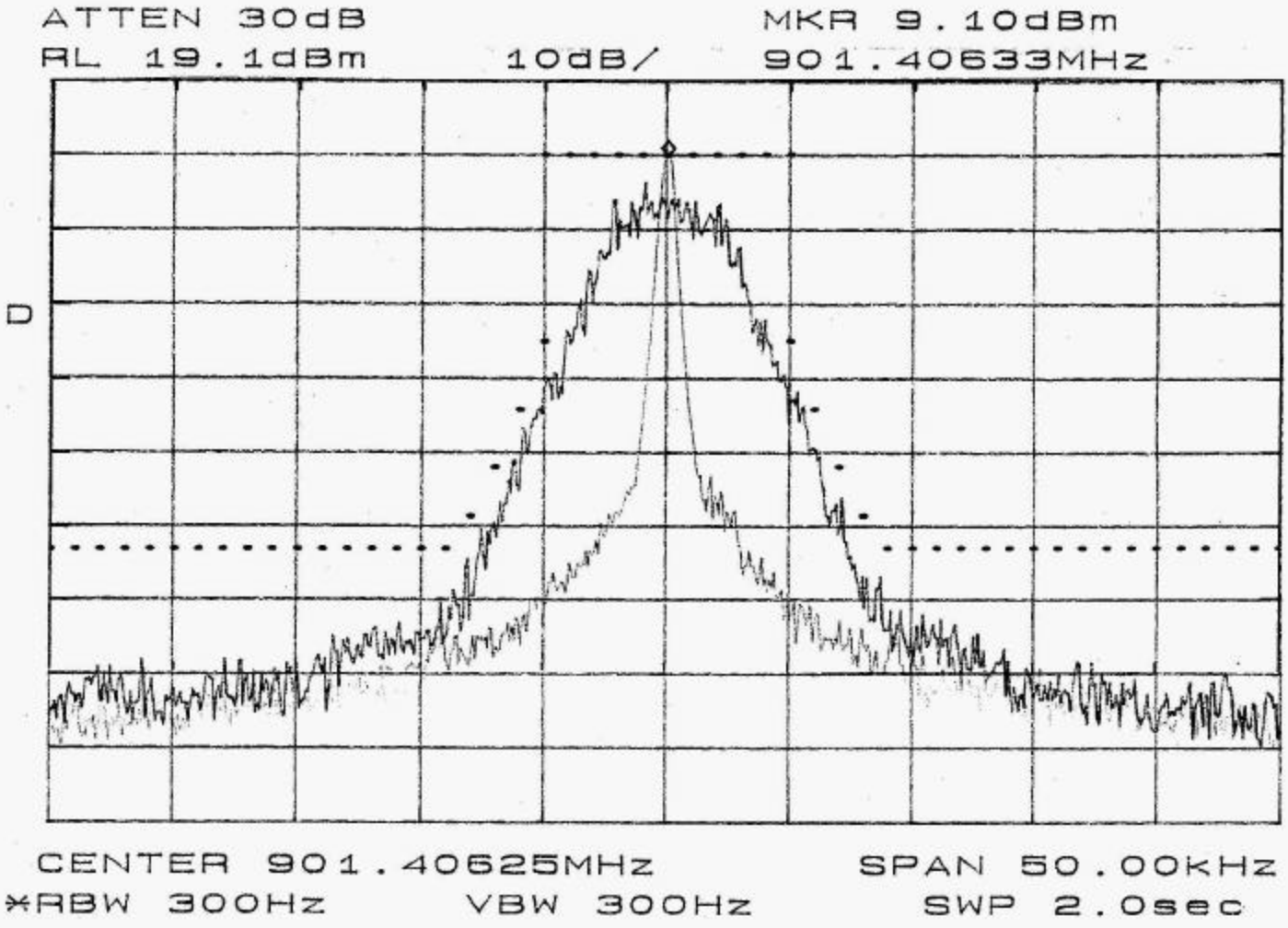
SUBMITTED MEASURED DATA – DEMODULATED RF DATA

e demodulated RF data plot is shown below. The data is a pseudo-random data stream gener-
d by the DSP at 9600 bits per second. The data is plotted by a HP53310A Modulation Domain
alyzer.



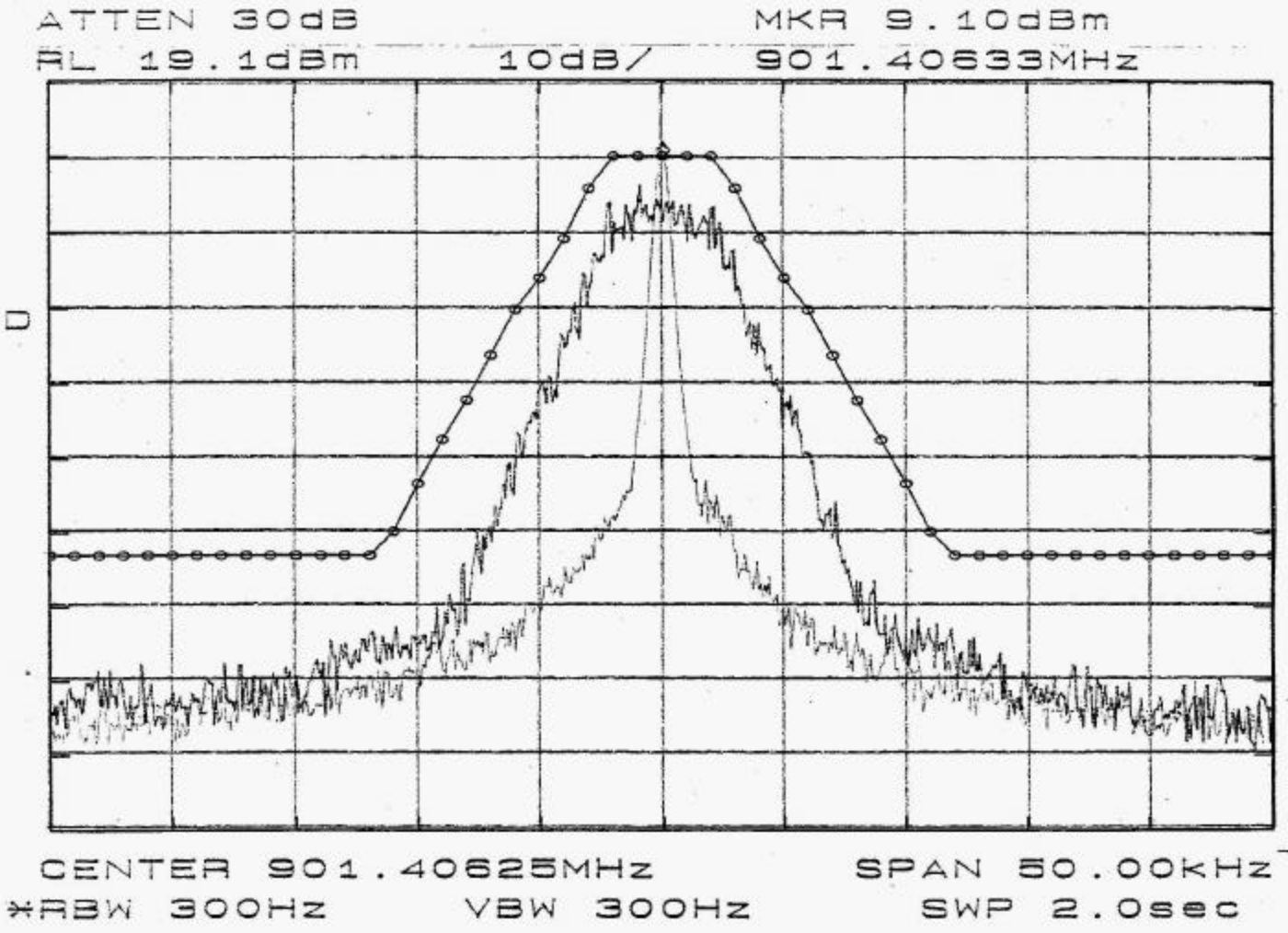
SUBMITTED MEASURED DATA – OCCUPIED BANDWIDTH

The occupied bandwidth plot with the NBPCS emission limits pursuant to Part 24.133 is shown below. The data is a pseudo-random data stream generated by the DSP at 9600 bits per second. The data is plotted by a HP8560A Spectrum Analyzer.



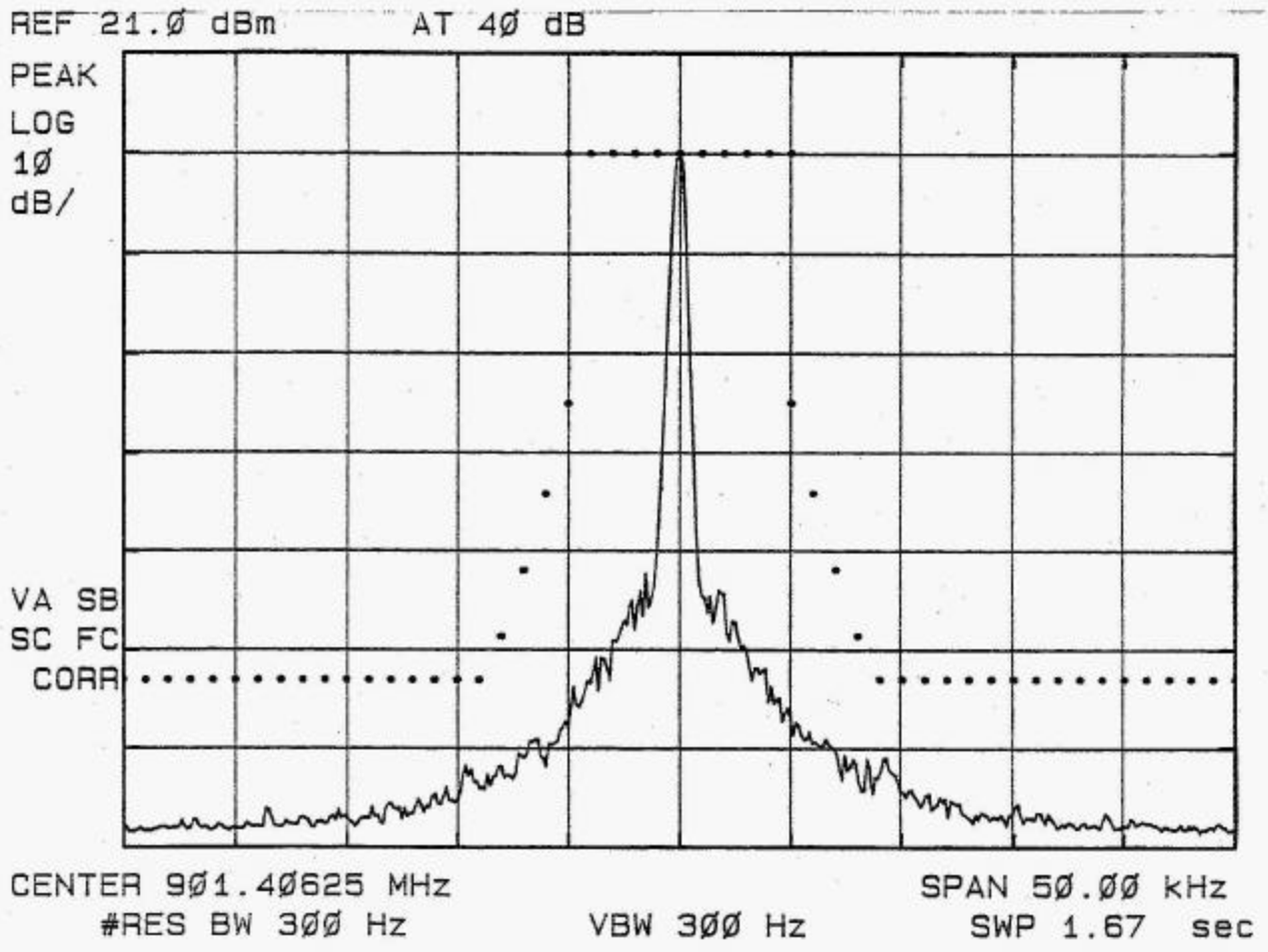
SUBMITTED MEASURED DATA – OCCUPIED BANDWIDTH

The occupied bandwidth plot with the SMR emission limits pursuant to Part 90.210 is shown below. The data is a pseudo-random data stream generated by the DSP at 9600 bits per second. The data is plotted by a HP8560A Spectrum Analyzer.



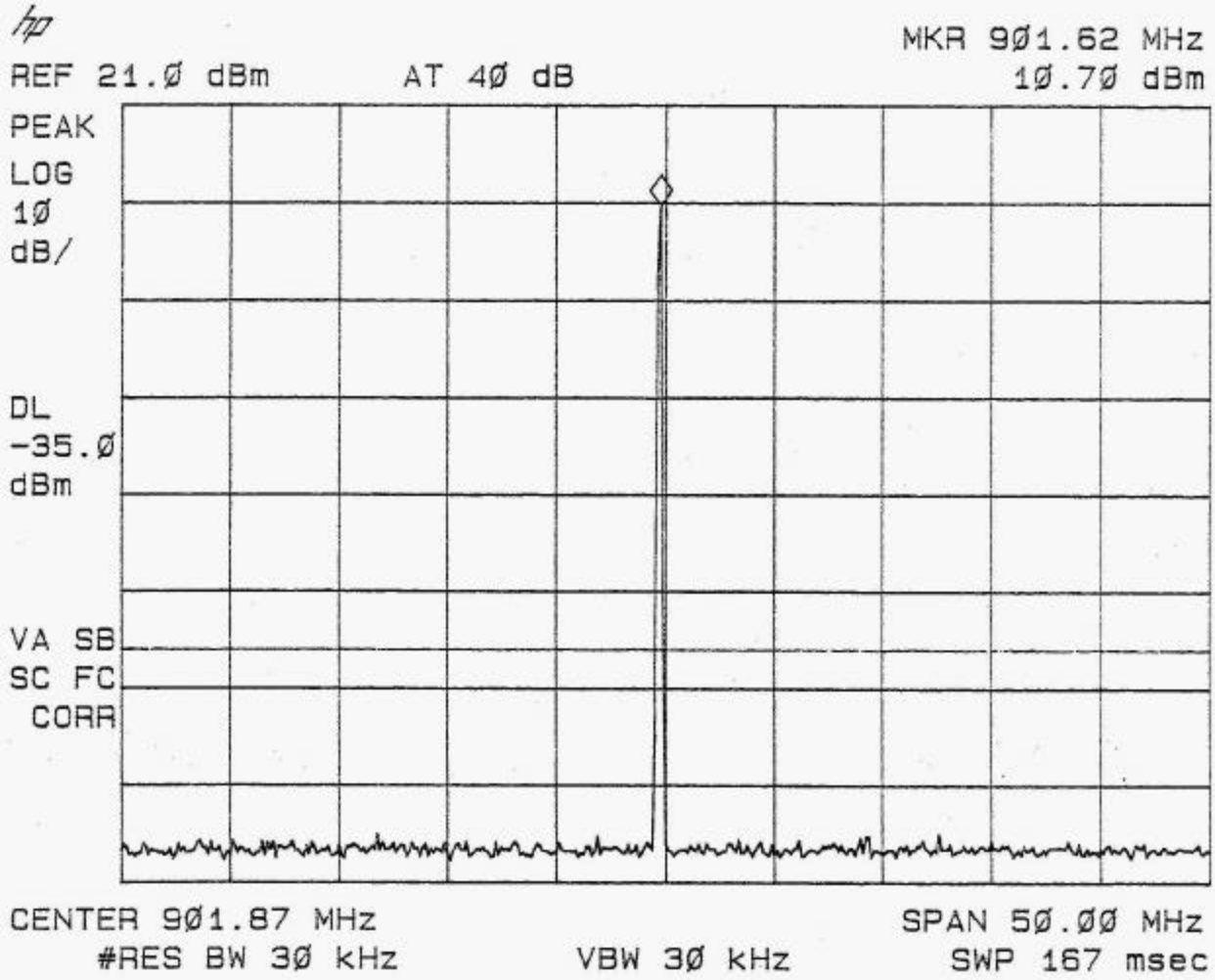
SUBMITTED MEASURED DATA– SPURIOUS EMISSIONS AT ANTENNA TERMINAL

The spurious emissions at antenna terminals is plotted below by a HP8596E Spectrum Analyzer. The frequency range is centered on the carrier frequency and spans +/-25 KHz. The emission limits are drawn pursuant to Part 24.133 for an output power of 2 watts. There are no spurious emissions above these limits.



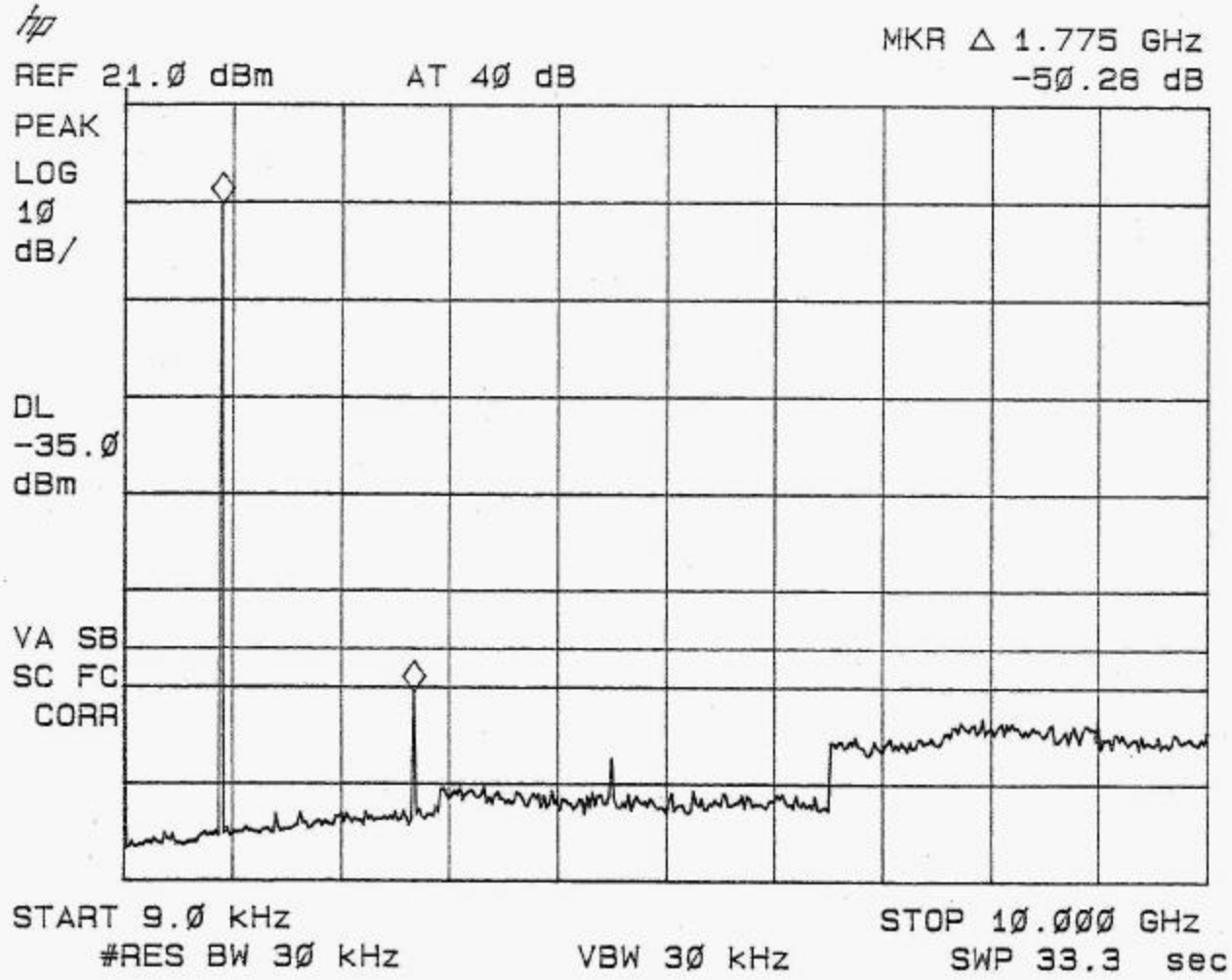
SUBMITTED MEASURED DATA– SPURIOUS EMISSIONS AT ANTENNA TERMINAL

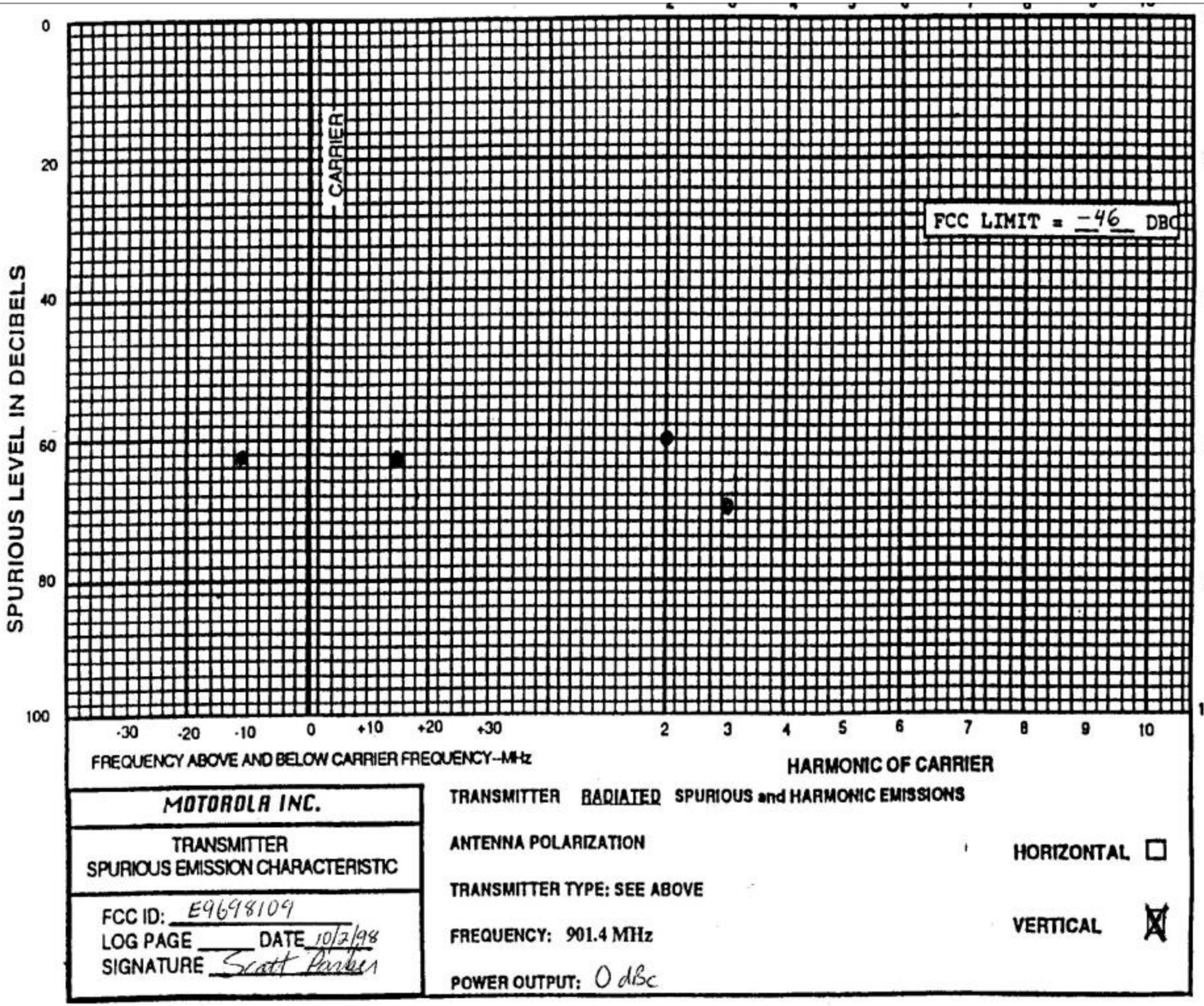
The spurious emissions at antenna terminals is plotted below by a HP8596E Spectrum Analyzer. The frequency range is centered on the carrier frequency and spans +/- 25 MHz and a display line is placed at -46 dBc. There are no detectable spurious emissions.



SUBMITTED MEASURED DATA– SPURIOUS EMISSIONS AT ANTENNA TERMINAL

The spurious emissions at antenna terminals is plotted below by a HP8596E Spectrum Analyzer. The frequency range is from 9 KHz to 10 GHz and a display line is placed at -46 dBc. The 1st LO's second harmonic is -63 dBc, it's third harmonic is -50.3 dBc, and it's fifth harmonic is -58.4 dBc. There are no other detectable spurious emissions.





MOTOROLA INC.

TRANSMITTER
SPURIOUS EMISSION CHARACTERISTIC

FCC ID: E9698109
LOG PAGE ____ DATE 10/7/98
SIGNATURE Scott Parker

TRANSMITTER RADIATED SPURIOUS and HARMONIC EMISSIONS

ANTENNA POLARIZATION

HORIZONTAL ☐

TRANSMITTER TYPE: SEE ABOVE

VERTICAL ☒

FREQUENCY: 901.4 MHz

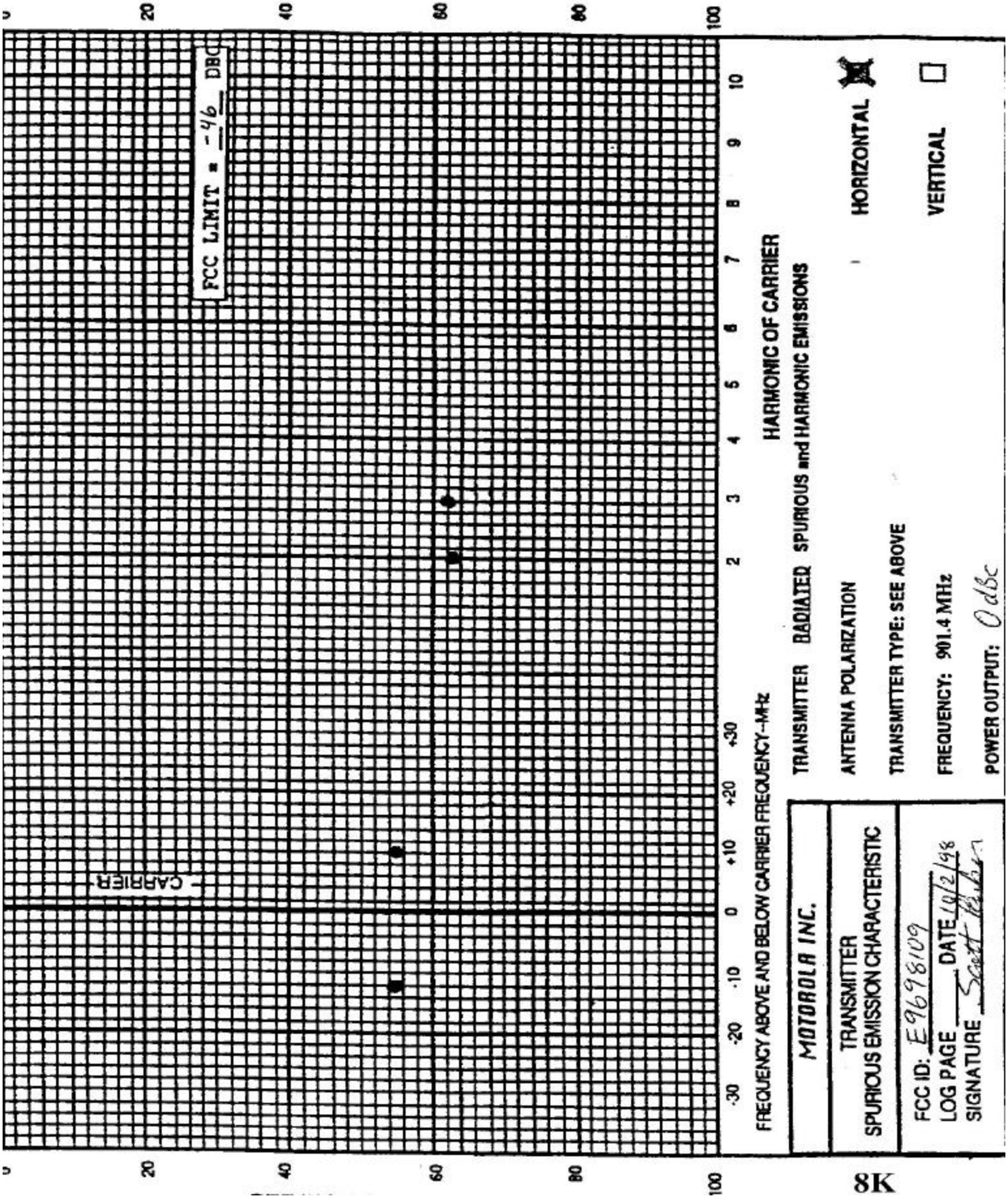
POWER OUTPUT: 0 dBc

EXHIBIT 8I

SUBMITTED MEASURED DATA– TX RADIATED SPURIOUS EMISSIONS

FCC:E9698109

SUBMITTED MEASURED DATA– TX RADIATED SPURIOUS EMISSIONS



SUBMITTED MEASURED DATA – FREQUENCY STABILITY VS. TEMPERATURE

A plot of the reference oscillator's (VCXO) frequency offset vs. temperature beyond the operating temperature range is shown below (the operating temperature range is -40 to +85 degrees Centigrade).

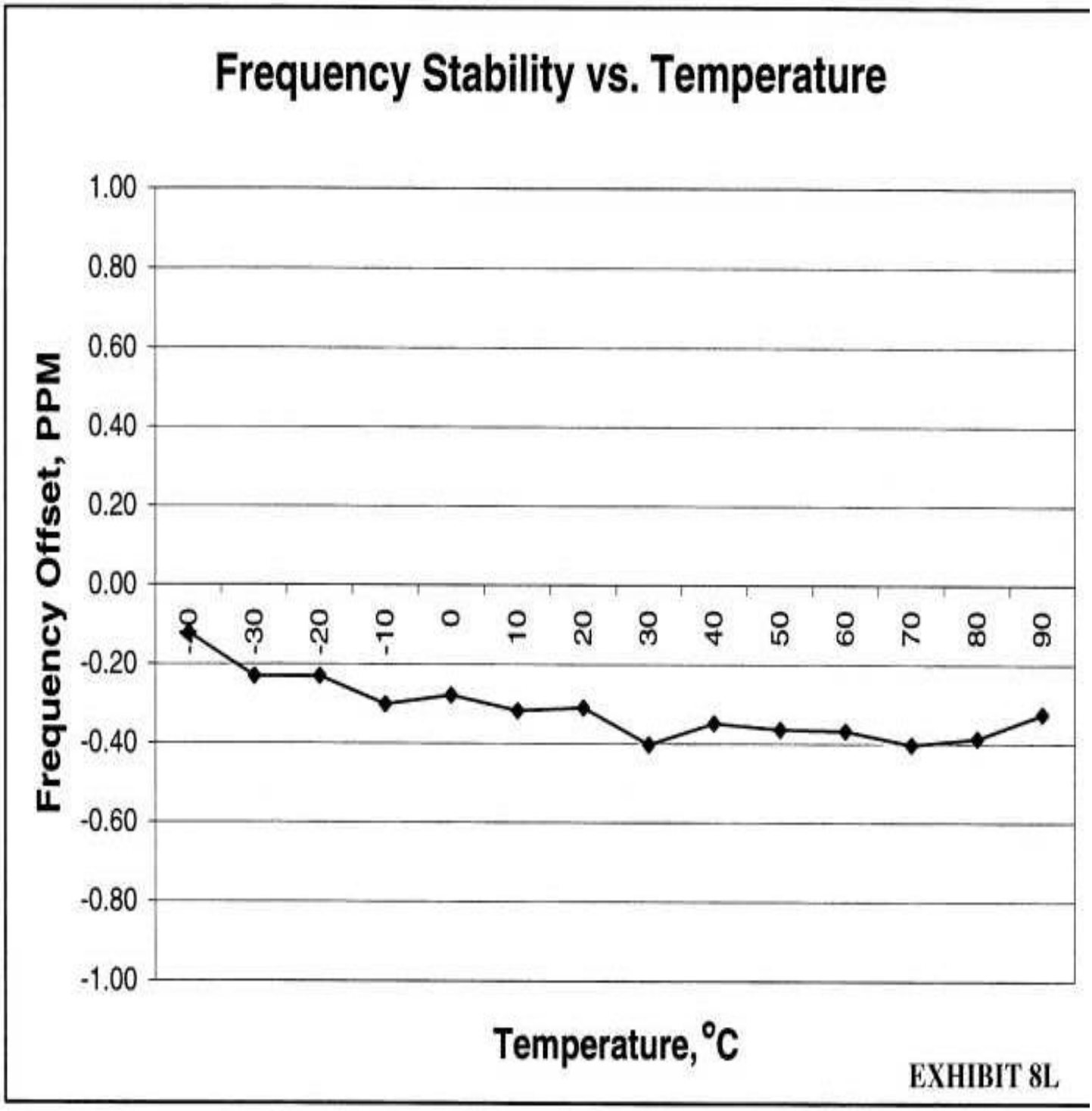
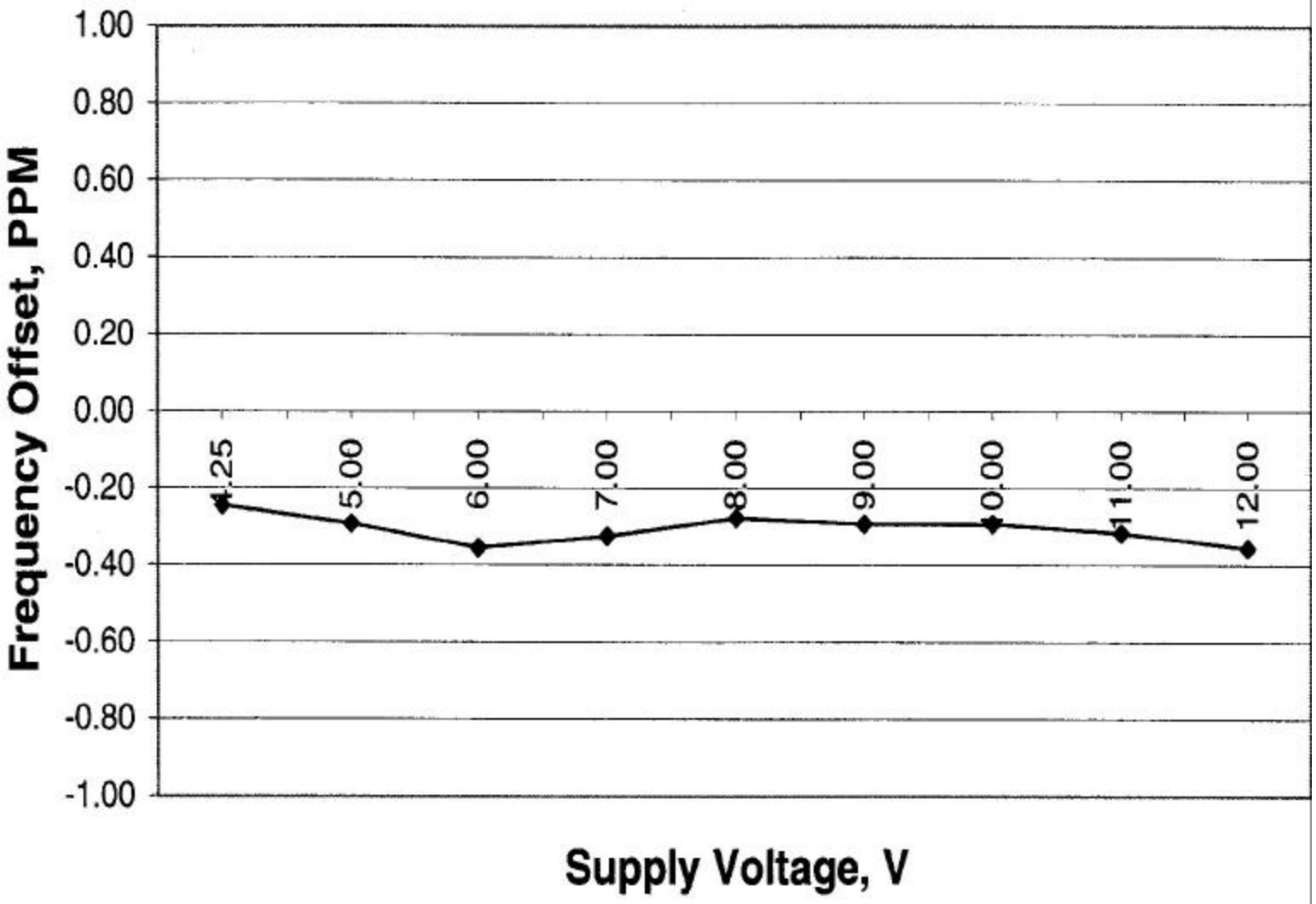


EXHIBIT 8L

SUBMITTED MEASURED DATA – FREQUENCY STABILITY VS. SUPPLY VOLTAGE

A plot of the reference oscillator's (VCXO) frequency offset vs. primary supply voltage from 85% to 115% of its nominal value (5 VDC). The external power supply is specified from 5 VDC to an absolute maximum of 12 VDC.



MEASUREMENT PROCEDURE AND TEST EQUIPMENT USED

Except where otherwise stated, all measurements are made following the Telecommunications Industry Standard (TIA) / Electronics Industries Association (EIA) Minimum Standard for Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (TIA/ EIA-603).

This exhibit presents a brief summary of how the measurements were made, the required limits, and the test equipment used.

The following procedures are presented with this application.

Description		**Exhibit Number**
___ 1. RF Power Output	_X_	11A
___ 2. Occupied Bandwidth	_X_	11B
___ 3. Spurious Emissions at Antenna Terminals	_X_	11C
___ 4. Transmitter Radiated Spurious Emissions	_X_	11D
___ 5. Frequency Stability	_X_	11E
___ 6. Test Equipment List	_X_	11F

MEASUREMENT PROCEDURE – RF POWER OUTPUT

RF Power Output - Pursuant to FCC Rules 2.985

Method of Measurement

The radiated RF power output is measured with the transmitter adjusted in accordance with the tune-up procedure to give the value of voltage and current specified in Exhibit 3 as required by 2.983(d)5.

The 20 dB attenuator and cable losses are measured using a network analyzer and calibrated out of the measurement. The 20 dB attenuator is connected to the unit's RF connector to supply a good 50 ohm load for the transmitter. The attenuator is then connected to an HP 8991A Peak Power Analyzer, via an HP 84815A Peak Power Sensor. The unit is placed into Tranmitter On test mode. The ampitude of the RF power out is measured on the peak power analyzer.

MEASUREMENT PROCEDURE – OCCUPIED BANDWIDTH

Occupied Bandwidth - Pursuant to FCC Rules 2.989

Method of Measurement

Data on occupied bandwidth is presented in the form of a spectrum analyzer plot which illustrates the transmitter sidebands. A plot is taken of the unmodulated carrier for reference, to which is superimposed the sideband trace generated by modulating the carrier with a pseudo-random four level signal. The DSP (U110) is used to generate the pseudo-random signal. This signal is digitally filtered internally in the DSP. The output of the splatter filter is then fed into the modulation input port of the fractional N synthesizer (U720). The RF output of the transmitter is then connected to the Hewlett Packard HP8560A Spectrum Analyzer through a Narda 20 dB attenuator.

The HP8560A Spectrum Analyzer's settings were as follows: detector on Positive Peak, resolution bandwidth on 300 Hz, video bandwidth on 300 Hz, sweep on automatic, span on 50 KHz. The occupied bandwith was measured by making multiple sweeps with the trace on Maximum Hold until the frequency spectrum ceased to change.

FCC Limits – Per Applicable Rule Parts

Measured Data: On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (Fd in kHz) of up to and including 20 kHz: at least $116\log_{10}\frac{(Fd + 5)}{3.05}dB$, or $50 + 10\log_{10}(Power)dB$, or 70 dB, whichever is the lesser attenuation. For any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (Fd in kHz) of more than 20 kHz: at least $43 + 10\log_{10}(Power)dB$ or 80 dB, whichever is the lesser attenuation. Power is specified in Watts.

MEASUREMENT PROCEDURE – SPURIOUS EMISSIONS AT ANTENNA TERMINAL

Spurious Emissions at Antenna Terminals - Pursuant to FCC Rules 2.991

Method of Measurement

Data on the spurious emissions at the antenna terminals is presented in the form of spectrum analyzer plots which illustrates the magnitude of spurious frequencies. A Narda 20 dB attenuator is connected to the RF connector to provide the suitable antenna load. Then the 20 dB attenuator is connected to the Hewlett Packard HP8596E Spectrum Analyzer and measurements are made using the transmit carrier frequency.

FCC Limits – Per Applicable Rule Parts

Spurious emissions at the antenna terminals shall be attenuated below the maximum level of emission of the carrier frequency in accordance with the following formula:
Spurious Attenuation = $43 + 10\log_{10}(\text{Power})\text{dB}$. Power is specified in Watts.

MEASUREMENT PROCEDURE – TX SPURIOUS EMISSIONS

Radiated Spurious Emissions - Pursuant to FCC Rules 2.993

Test Site

The test site is located in Boynton Beach, Florida, which is reasonably free from RF interference.

The equipment is placed on the turntable and connected to the intended power source. The measurement is performed with the optional external antenna as the radiating element. A horn antenna located thirty (30) meters away from the transmitter picks up any signal radiated from the transmitter. A spectrum analyzer covering the necessary frequency range is used to detect and measure any radiation picked up by the antenna.

Method of Measurement

The testing procedure is repeated for both horizontal and vertical polarizations of the receiving antenna. Relative signal strength is indicated on the spectrum analyzer connected to this antenna. Actual radiated signal strength for each spurious and harmonic frequency observed is correlated to a standard signal generator with a calibrated out connected to a horn quadridge antenna and with its frequency adjusted to the particular discrete frequency. The signal strength is then read directly from the generator. Actual measurements are recorded on the attached graphs.

FCC Limits – Per Applicable Rule Parts

Radiated spurious emissions shall be attenuated below the maximum level of emission of the carrier frequency in accordance with the following formula:
Spurious Attenuation = $43 + 10\log_{10}(\text{Power})\text{dB}$. Power is specified in Watts.

MEASUREMENT PROCEDURE – FREQUENCY STABILITY

Frequency Stability - Pursuant to FCC Rules 2.995

Method of Measurement

A. Temperature (Non-heated type crystal oscillators)

Frequency measurements are made at the extremes of the temperature range -40 to +90 degrees Centigrade and at intervals of not more than 10 degrees Centigrade throughout the range. Sufficient time is allowed prior to each measurement for the circuits to stabilize.

The Hewlett Packard HP53310A Modulation Domain Analyzer is used to measure the transmit carrier frequency. The RF output is connected to the MDA through a 20 dB attenuator. The Thermotron 2800 Programmable Temperature Chamber is used to control the temperature range environment.

B. Power Supply Voltage

The Hewlett Packard HP3631A DC Power Supply is connected to an RS232 serial interface circuit that directly supplies the primary DC supply voltage to the radio. The RF output is connected to the Hewlett Packard HP53310A Modulation Domain Analyzer through a 20 dB attenuator. The transmit carrier frequency is used in making the measurements.

FCC Limits – Pursuant 2.995 (a)(1) & (d)(1) and Applicable Rule Parts

Temperature: frequency stability of 1 PPM from -40 to +85 degrees Centigrade.

Power Supply Voltage: frequency stability of 1 PPM at 85% and 115% of the nominal primary supply voltage.

MEASUREMENT PROCEDURE – TEST EQUIPMENT LIST

Test Equipment List

1. Hewlett Packard HP53310A Modulation Domain Analyzer
2. Hewlett Packard HP8991A Peak Power Analyzer with HP84815A Peak Power Sensor
3. Hewlett Packard HP8560A Spectrum Analyzer
4. Hewlett Packard HP8596E Spectrum Analyzer
5. Hewlett Packard HP53131A Universal Counter
6. Hewlett Packard HP3631A DC Power Supply
7. LeCroy 334M Oscilloscope
8. Narda 20 dB attenuator (2 watt)
9. Serial Interface Cable Assembly
10. RS232 Serial Interface Circuit
11. Thermotron 2800 Programmable Temperature Chamber