Exhibit 7. Measurement Procedures Used for Submitted Data

EXHIBIT 7A - RF Output Power vs. DC Power Input - Pursuant to 47 CFR 2.1046

The transmitter is operated under normal conditions at the specified nominal DC input voltage. The antenna output is terminated in 50 ohms. The DC supply path to the final stage only is interrupted to allow insertion of the a DC ammeter in series with the DC supply. The DC voltage drop of the ammeter is negligible. A DC voltmeter is computed as the product of the DC current (in amps) times the DC voltage (in volts). This measurement is performed at the upper and lower limits of the frequency range. At each frequency, the measurement is performed at the upper and lower limits of the specified adjustable power range.

EXHIBIT 7B - Transmit Audio Frequency Response – Pursuant to 47 CFR 2.1047(a)

The transmitter output is monitored with an HP8901B modulation analyzer, whose FM demodulator output is fed to an HP8903B audio analyzer. De-emphasis or filtering within the test equipment is not used. An audio oscillator signal, derived from the HP8903B Audio Analyzer, is connected to the microphone audio input of the transmitter. At a frequency of 1 kHz, the level is adjusted to obtain 20% of full system deviation, to ensure that limiting does not occur at any frequency in the range of 300 – 3000 Hz. A constant input level is then maintained and the oscillator frequency is varied between the range of 100 Hz to 5000 Hz. The frequency response is plotted, using a reference of 0 dB at 1 kHz.

EXHIBIT 7C - Transmit Audio Post Limiter Lowpass Filter Response – Pursuant to 47 CFR 2.1047(a)

The audio oscillator portion of an HP8903B audio analyzer is connected to the input of the post limiter lowpass filter. The output of the lowpass filter is measured with an HP35665A dynamic signal analyzer. The response is swept between the limits of 100 Hz and 100 kHz. Oscillator level is chosen to be as high as possible and that will not cause limiting at any frequency, and is maintained constant versus frequency.

EXHIBIT 7D – Modulation Limiting Characteristic – Pursuant to 47 CFR 2.1047(b)

An audio oscillator is connected to the microphone audio input. The transmitter output is monitored with an HP8901B modulation analyzer. The flat frequency response FM demodulator output of the HP8901B is fed to an HP8903B audio analyzer. The 20 kHz lowpass filter of the modulation analyzer is used to reduce the level of residual high frequency noise. The oscillator level is adjusted, at 1 kHz, to obtain 60% of full system deviation. The oscillator level is then varied over a range of +/-25dB in 5 dB increments, and the resulting deviation is plotted. This measurement is repeated at 300 Hz and 3 kHz. The above procedure is performed three times, for conditions with Tone Private Line, Digital Private Line, and Carrier Squelch Mode (without subaudible signaling).

EXHIBIT 7E - Occupied Bandwidth - Pursuant to 47 CFR 2.1049(c)(1)

Procedure for Occupied Bandwidth for Voice Transmission

An audio oscillator is connected to the microphone audio input. The frequency is set to 2500 Hz and the amplitude is adjusted to a level 16 dB above that is required to produce 50% of full system deviation at the frequency of maximum response of the audio modulation circuit, in accordance with FCC rules Part 2.1049(c)(1).

The transmitter output is connected, via a 30 dB attenuator, which also provides a 50-ohm termination to the transmitter output, to an HP8560E spectrum analyzer that outputs directly to a computer. Spectrum analysis of the transmitter output is performed to at least +/-2.5 times the channel spacing. The unmodulated carrier is used to establish a 0-dB reference, then with the modulating signal applied. This 0 dB reference is equivalent to the power rating of the transmitter, which is specified in each page of the exhibit. This measurement is repeated with

Tone Private Line continuous subaudible signaling added (250.3 Hz at 15% full system deviation) and again with Digital Private Line (code 131 at 15% of full system deviation) for both channel spacings, 12.5 kHz and 25 kHz.

Procedure for Occupied Bandwidth for Data Transmission

An audio function generator capable of voltage control of frequency is connected to the flat (non pre-emphasized) transmit audio input of the equipment under test. A second function generator producing a square wave output at a frequency of 1200 Hz is connected to the voltage control input of the first generator. The first generator is set to produce a sine wave signal at a center frequency of 2500 Hz, and the amplitude of the square wave from the second generator is adjusted so that the frequency of the first generator is varied +/-500 Hz. The resulting output of the first generator is an AFSK sine wave signal that shifts between two discrete frequencies, 2000 Hz and 3000 Hz, at a rate of 1200 Hz. The amplitude of the first generator, which modulates the transmitter, is adjusted for full system deviation.

The transmitter output is connected, via a suitable attenuator which also provides a 50-ohm termination to the transmitter output, to an HP8560E spectrum analyzer that outputs directly to a computer. Spectrum analysis of the transmitter output is performed to at least +/-2.5 times the channel spacing. The unmodulated carrier is used to establish a 0-dB reference, then with the modulating signal applied. This 0 dB reference is equivalent to the power rating of the transmitter, which is specified in each page of the exhibit. This measurement is repeated with Tone Private Line continuous subaudible signaling added (250.3 Hz at 15% full system deviation) and again with Digital Private Line (code 131 at 15% of full system deviation) for both channel spacings, 12.5 kHz and 25 kHz.
In each case, the amplitude of the modulating signal is adjusted so the the total deviation level, including the TPL or DPL modulation, is the full system deviation.

EXHIBIT 7F - Conducted Spurious Emissions - Pursuant to FCC Rule 2.1051

The output of the transmitter is connected, via a suitable attenuator, to the input of an HP8560E spectrum analyzer. This data is measured at the upper and lower frequency limits of the frequency range. If transmit power is adjusted, the measurement is repeated at various power levels including minimum and maximum.

EXHIBIT 7G - Radiated Spurious Emissions - Pursuant to 47 CFR 2.1053

Transmitter radiated spurious emissions were measured by Motorola Plantation EMC Lab. Measurements were made at an approved open field test site constructed in accordance with Appendix B, FCC/OST 55 (1982), and were performed in accordance with the Code of Federal Regulations, Title 47, Part 2, paragraph 2.1053. The specification limit corresponding to a level of 43 dB + 10log(Pout) for 25kHz & 50 dB +10log(Pout) for 12.5kHz below the fundamental carrier power of the transmitter. The data is plotted as “Radiated Spurious Emissions” on the graphs comprising EXHIBIT 6G.

The test site is: Motorola Plantation EMC Lab, located in Florida, United States of America. Motorola Plantation EMC Lab is listed with FCC and Industry Canada as follows:

1. FCC OATS registration number is: 91932
2. Industry Canada OATS registration number is: IC 3679

Site address:
8000 West Sunrise Blvd.
Plantation, Florida 33322

EXHIBIT 7H – Frequency Stability vs. Temperature and vs. Voltage - Pursuant to 47 CFR 2.1055(a)(b)(d)

Frequency Stability vs. Temperature data is measured in accordance with FCC Rules Part 2.1055(a)(1). An HP8901B modulation analyzer is used to measure the frequency of the signal transmitter by the radio. The radio is placed in a Votsch, model VT4010 Temperature Chamber, and the frequency is measured as the temperature is incremented from –30 to +60 degrees C in 5 degrees increments.Frequency Stability vs. Voltage data is measured in accordance with FCC Rules Part 2.1055(d). An HP8901B modulation analyzer is used to measure the frequency of the signal transmitter by the radio by way of a 30dB attenuator. The supply voltage of the radio is swept +20% and –20% of 13.6Vdc.

EXHIBIT 7I - Transient Frequency Behavior (FCC Rules Part 90.214)

This data measured in accordance with FCC Rules . Applicable method of measurement and definition in Section 2.2.19 of the TIA/EIA 603. Specifically, the triggering level was set in the following manner.

The output of the radio is connected to an HP8901B modulation analyzer by way of a directional coupler, 30dB attenuator, and 2:1 combining network. This output is first measured with an HP437 power meter and then the power meter is replaced by the HP8901B modulation analyzer, and the RF output of an HP8657B signal generator is connected to the second port of the combining network at a level of 30dB less than the output level of the radio measured after the attenuator. The RF output of the HP8657B signal generator is modulated with a 1 kHz tone and deviation of 12.5 kHz or 25 kHz depending on the channel spacing. The modulation output of the HP8901B modulation analyzer is connected to a digital storage oscilloscope, Phillips PM3392. The signal generator is turned on first, and then the radio keyed or dekeyed depending on the particular test. The oscilloscope is triggered by way of a RF peak detector that detects the RFoutput of the radio by way of the directional coupler.

The picture of the oscilloscope display is stored on a floppy disk and transferred to a computer. The key up attack time plots show the 1 kHz from the RF signal generator signal from the modulation output of the HP8901B modulation analyzer, and when the radio is keyed, the output signal from the radio captures the receiver of the HP8901B modulation analyzer, resulting in the carrier only signal. The dekey decay time plots show the unmodulated signal from the radio and when the radio is dekeyed, the 1 kHz from the RF signal generator signal captures the receiver of the HP8901B modulation analyzer, resulting in the 1 kHz signal shown in the plots.

7J. Measurement Equipment List ---- 47 CFR 2.1033(c)

1) Computer: HP Pentium PC, Window 2000.
2) Spectrum Analyzer: HP 8563E, 9 kHz-26.5 GHz.
3) Spectrum Analyzer: HP 8560E, 30 Hz-2.9 GHz.
4) RF Signal Generator: HP 8657B, 0.1 - 2060 MHz RF Signal Generator.
5) Modulation Analyzer. HP 8901B.
6) Audio Analyzer .HP 8903B.
7) Dynamic Signal Analyzer: HP 35665A
8) Power Meter. HP437B. Sensor 80401A
9) Oscilloscope. Phillips PM3392.
10) Multimeter: Hewlett Packard 34401A.
11) DC Power Supply: Hewlett Packard 6033A
12) Directional Coupler: Hewlett Packard 778D, Dual Directional Coupler.
13) Temperature Chamber: Votsch, model VT4010.
14) 30 dB attenuator: narda, model 768-30

Additional equipment used by EMC Test Laboratory

Manufacturer	Item	Item Version/	Serial
Name	Name	Model #	Number
	Description		

OATS Test Equipment

Rohde & Schwarz	Signal Generator	SMP22	DE21162
Rhode & Schwarz	Spectrum Analyzer/ESI Test Receiver	ESI 26	8277691009
Hewlett Packard	Power Supply	6032A	3542A12712
Sunol Sciences Corp.	System controller	SC98V	213981
Sunol Sciences Corp.	System controller	SC98V	313981
Sunol Sciences Corp.	Turntable. Flush Mount 2M	FM2011	NA
Sunol Sciences Corp.	Antenna Positioning Tower	TLT95/TWR95	NA
Motorola	OATS RF Tray	2000	NA

High Pass Filter

Trilithic	High Pass Filter	X5HX1612-0-75-AA	9811186

OATS Antennas

Watkins- Johnson	L.P. Antenna. Freq.0.5-12.4GHZ	WJ-48010	234
Watkins- Johnson	L.P. Antenna. Freq.0.5-12.4GHZ	WJ-48010	173
A.H. Systems Inc.	DRG Horn Freq. 700MHZ-18GHZ	SAS-200/571	272
A.H. Systems Inc.	DRG Horn Freq. 700MHZ-18GHZ	SAS-200/571	271
EMCO	Biconilog. Freq. 20MHZ-1GHZ	3143	9403-1019
EMCO	Biconilog. Freq. 20MHZ-1GHZ	3141	9703-1047
Schaffner-Chase EMC Ltd.	Bilog Antenna	CBL6112B	2660

AC Line Conducted

EMCO	Line Impedance Stabilization Network	3810/2NM LISN	9612-1740

OATS PreAmplifier

MITEQ	25 dB Gain Amplifier 1-18GHz	AFS5-00101800-25-ULN	