TEST SET-UP PROCEDURES AND TEST EQUIPMENT USED

Pursuant to 47 CFR 2.947

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

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:

1) Test Equipment List
2) RF Power Output
3) Audio Frequency Response
4) Post Limiter Lowpass Filter Response
5) Modulation Limiting Characteristic
6) Occupied Bandwidth
7) Conducted Spurious Emissions
8) Radiated Spurious Emissions
9) Frequency Stability vs. Temperature and Voltage

Test Equipment List

Pursuant to 47 CFR 2.1033(c)

The following test equipment was used to perform the measurements of the submitted data. The calibration of this equipment is performed at regular intervals.

Transmitter Frequency:
HP 5385A Frequency Counter with High-Stability Reference

Temperature Measurement:
HP 2804A Quartz Thermometer

Transmitter RF Power:
HP 435A or 438A Power Meter with HP 8482A Power Sensor

DC Voltages and Currents:
Fluke 8010A Digital Voltmeter

Audio Responses:
HP 8903B Audio Analyzer

Deviation:
HP 8901B Modulation Analyzer

Transmitter Conducted Spurious and Harmonic Emissions:
HP 8566B Spectrum Analyzer with HP 85685A Preselector

Transmitter Occupied Bandwidth:
HP 8591A Spectrum Analyzer

Radiated Spurious and Harmonic Emissions:

Radiated Spurious and Harmonic Emissions were performed by:

Elite Electronic Engineering Company
4309-11 N. Banana River Blvd.
Cocoa Beach, Florida 32931

and documentation was provided by:

Elite Electronic Engineering Company
1516 Centre Circle
Downers Grove, Illinois 60515-1082

Measurement Procedures Used for Submitted Data

EXHIBIT 6A - **RF Power Output vs. DC Power Input** – Pursuant to 47 CFR 2.1046

Conducted power is measured in accordance with accordance with TIA/EIA-603-A section 2.2.1.2. The transmitter under test is connected directly to an H-P model 435 or 438A power meter using two cascaded 20 dB attenuator pads (which also form the 50-ohm RF terminating load), without the use of an interconnecting RF cable. The calibration of the power meter, detector, and attenuator pads is verified on an annual basis. Other power measurement systems that may be used are correlated with this calibrated reference system before measurements are performed, and calibration factors are adjusted as necessary to obtain precise correlation.

The transmitter is operated under normal conditions at the specified nominal dc input voltage. The DC supply path to the final stage only is interrupted to allow insertion of a DC ammeter in series with the DC supply. The DC voltage drop of the ammeter is negligible. A DC voltmeter is used to measure the DC voltage applied to the final stage. The DC input power to the final stage (in watts) is computed as the product of the DC current (in amperes) times the DC voltage (in volts). This measurement is performed at the lowest, the middle and the highest operating frequencies of the operating bandwidth of the equipment.

EXHIBIT 6B - Transmitter 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 6C - **Transmitter 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 the HP8903B audio analyzer. The response is swept between the limits of 100 Hz and 100 kHz. Oscillator level is chosen to be the as high as possible that will not cause limiting at any frequency, and is maintained constant vs. frequency.

EXHIBIT 6D - **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

Measurement Procedures Used for Submitted Data (continued)

deviation. The oscillator level is then varied over a range of ±25 dB 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 four times, for conditions with Tone Private Line, Digital Private Line, Trunking (these are continuous subaudible signaling formats), and without subaudible signalling (referred to as “carrier squelch mode.”)

EXHIBIT 6E - **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 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 HP8591A spectrum analyzer that outputs to an HP7470A plotter. 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 is 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), again with Digital Private Line (code 131 at 15% of full system deviation), and again with Trunking modulation (297 BPS at 32% of full system deviation). These measurements are then repeated for all types of signaling or data transmission that are not used simultaneously with voice. In these cases, the signaling or data modulation replaces the 2500 Hz tone modulation. The repeated measurements are performed separately for conditions with Tone Private Line, Digital Private Line, Trunking, and without subaudible signaling.

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 as described above, to an HP8591A spectrum analyzer that outputs to an HP7470A plotter. 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 as described above, and then the modulating signal is applied. This measurement is repeated with Tone Private Line continuous subaudible signaling added (250.3 Hz at 15% full system deviation) again with

Measurement Procedures Used for Submitted Data (continued)

Digital Private Line (code 131 at 15% of full system deviation), and again with Trunking modulation (297 BPS at 32% of full system deviation). In each case, the amplitude of the modulating signal is adjusted so that the total deviation level, including the TPL or DPL modulation, is the full system deviation.

EXHIBIT 6F - **Conducted Spurious Emissions** – Pursuant to 47 CFR 2.1051

The output of the transmitter is connected, via a suitable attenuator, to the input of an HP 8566B Spectrum Analyzer with HP 85685A Preselector. After a carrier reference level has been established, a tunable notch filter is inserted between the attenuator and the spectrum analyzer to allow suppression of the carrier level. The effects of the notch filter on other frequencies, if any, are taken into account. The level of spurious emissions, in dB relative to the carrier, is plotted. This data is measured at the upper and lower frequency limits of the frequency range. If transmit power is switchable or adjustable, the measurement is repeated at minimum and maximum power settings.

EXHIBIT 6G - **Radiated Spurious Emissions** – Pursuant to 47 CFR 2.1053

Transmitter radiated spurious emissions were measured by Elite Electronic Engineering Company, 4309-11 N. Banana River Blvd., Cocoa Beach, Florida 32931. 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 data is plotted as “Radiated Spurious and Harmonic Emissions (Horizontal and Vertical)” on the graphs comprising EXHIBIT 6G. The specification limit corresponding to a level of 43 dB + 10 log (Pout) below the fundamental carrier power of the transmitter is indicated on each graph for reference. If transmit power is switchable or adjustable, the measurement is repeated at minimum and maximum power settings.

The following additional instruments are used in performing the radiated field strength measurements:

- Hewlett Packard model 8566A spectrum analyzer
- Hewlett Packard model 8350B sweep oscillator
- Empire Devices DM-105/T3 tuned dipole antenna (400-1000 MHz)
- EMCO 3121C-DB4 tuned dipole antenna (400-1000 MHz)
- EMCO 3105 ridged W.G. antennas (1-12.4 GHz)
- Bird model 8130 50 Ω, 50 Watt load

EXHIBIT 6H-1 and 6H-2 - **Frequency Stability vs. Temperature and vs. Voltage** – Pursuant to 47 CFR 2.1055(a)(b) and (d)

Frequency Stability vs. Temperature data is measured in accordance with FCC Rules Part 2.1055(a)(1). An HP5061A Cesium Beam Frequency Standard is used as a reference for frequency measurements. The calibration of the temperature measurements of the environmental chamber is referenced to an HP2804A Quartz Thermometer.

Measurement Procedures Used for Submitted Data (continued)

Frequency Stability vs. Voltage data is measured in accordance with FCC Rules Part 2.1055(d). An HP5061A Cesium Beam Frequency Standard is used as a reference for frequency measurements. The low-voltage point at which the transmitter ceases to operate or resets is noted and included in this exhibit.