Applicant: Motorola, Inc. **Equipment Type**: ABZ99FT4046

Measurement Procedures Used for Submitted Data

EXHIBIT 6A - RF Power Output vs. DC Power Input (FCC Rules Part 2.993)

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 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 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 6B - Transmitter Audio Frequency Response (FCC Rules Part 2.987)

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 300 - 3000 Hz range. A constant input level is then maintained and the oscillator frequency is varied between the range of 100 Hz to 3000 Hz. The frequency response is plotted, using a reference of 0 dB at 1 kHz. The audio oscillator signal is then increased to a level 20 dB greater than that required to produce standard test modulation at 1 kHz, and the oscillator frequency is varied from 3 kHz to at least 30 kHz. The frequency response is plotted, using a reference of 0 dB at 1 kHz.

EXHIBIT 6C - Transmitter Audio Post-Limiter Low-Pass Filter Response (FCC Rules Part 2.987)

The audio oscillator portion of an HP8903B audio analyzer is connected to the input of the post-limiter low pass filter. The output of the filter, at the point where the signal is applied to the modulator's input, is monitored by the HP8903B audio analyzer. The response is swept between the limits of 100 Hz and 100 kHz. Oscillator level is chosen to be the highest possible which will not cause limiting at any frequency, and is maintained constant vs. frequency.

Measurement Procedures Used for Submitted Data (continued)

EXHIBIT 6D - Modulation Limiting Characteristic (FCC Rules Part 2.987)

An audio oscillator is connected to the microphone audio input. The transmitter output is monitored with an HP8901B modulation analyzer, whose non-de-emphasized FM demodulator output is fed to an HP8903B audio analyzer. The modulation analyzer's 20 kHz low-pass filter 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 ±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 three times, for conditions with Private Line, with Digital Private Line (continuous subaudible signaling formats) and without.

EXHIBIT 6E - Occupied Bandwidth (FCC Rules Part 2.989)

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 2.989(a)(1). The transmitter output is connected, via a suitable attenuator, to an HP8593A spectrum analyzer which outputs to an HP7470A plotter. Spectrum analysis of the transmitter output is performed to at least ±2.5 times the channel spacing, first of the unmodulated carrier to establish a 0 - dB reference, then with the modulating signal applied. This measurement is repeated with 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). These measurements are then repeated for all types of signaling or data transmission which are used non-simultaneously with voice, in which case the signaling or data modulation replaces the 2500 Hz tone modulation, in each case the measurement being performed separately for conditions with Private Line, with Digital Private Line, 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 transmitter 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 a AFSK sine wave signal which 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, or ±5 kHz.

Measurement Procedures Used for Submitted Data (continued)

The transmitter output is connected, via a suitable attenuator, to an HP8593A spectrum analyzer which outputs to an Hp7470A plotter. Spectrum analysis of the transmitter output is performed to at least ±2.5 times the channel spacing, first of the unmodulated carrier to establish a 0-dB reference, then with the modulating signal applied. This measurement is repeated with 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). In each case, the amplitude of the modulating signal is adjusted so that the total deviation level, including the PL or DPL modulation, is ±5 kHz.

EXHIBIT 6F - Conducted Spurious Emissions (FCC Rules Part 2.991)

The output of the transmitter is connected, via a suitable attenuator, to the input of an HP8593A spectrum analyzer. 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 effect of the notch filter on other frequencies, if any, is 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 adjustable, the measurement is repeated at various power levels including minimum and maximum.

EXHIBIT 6G - Radiated Spurious Emissions (FCC Rules Part 2.993)

Transmitter radiated spurious emissions were measured by Elite Electronic Engineering Company, 1516 Centre Circle, Downers Grove, Illinois 60515. 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 FCC Code of Federal Regulations, Title 47, Part 2, paragraph 2.993. 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 50 dB + 10 log P_{out} below the transmitter’s fundamental carrier power is indicated on each graph for reference.

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

- HP model 8566A spectrum analyzer
- HP 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-ohm, 50-watt load

Measurement Procedures Used for Submitted Data (continued)

EXHIBIT 6H - Frequency Stability vs. Temperature (FCC Rules Part 2.995)

This data is measured in accordance with FCC Rules Part 2.995(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.

EXHIBIT 6J - Frequency Stability vs. Voltage (FCC Rules Part 2.995)

This data is measured in accordance with FCC Rules Part 2.995(d). An HP5061A Cesium Beam Frequency Standard is used as a reference for frequency measurements.

EXHIBIT 6K - Transient Frequency Behavior (FCC Rules Part 90.214)

The testing was performed per the method outlined in 2.2.19. Specifically, the triggering level was set in the following manner.

1. The radio (25W) was keyed into a HP438A Power meter in order to set -10 dBm level. This level is 40 dB lower than the maximum input level of the HP8901B.

2. A HP8657A Signal Generator modulated with a 1 kHz tone and (12.5 kHz or 25 kHz) of deviation was then input to the Power Meter and the output adjusted to achieve a -10 dBm level. This level was then lowered by 20 dB, and maintained for the balance of the testing.

3. The 30 dB attenuator was then removed from the radio output path, thus creating a 50 dB difference between the Generator level and the transmitter level.

All other measurements where completed per the procedure outlined in part 2.2.19 of TIA/EIA-603 and the results saved and plotted.