TEST SET-UP PROCEDURES

Equipment Used for Submitted Data

Transmitter Frequency:
HP8901B Modulation Analyzer

Temperature Measurement:
HP8901B Modulation Analyzer
HP8482B Power Sensor and 30dB Attenuator

DC Voltage and Currents:
HP6623A Power Supply
HP34401A Digital Multimeter

Deviation:
HP8901B Modulation Analyzer

Transmitter Occupied Bandwidth:
HP8562E Spectrum Analyzer

Transmitter Conducted Spurious and Harmonic Emissions:
HP8562E Spectrum Analyzer
K & L (11SH10-1500/T8000) High Pass Filter

Transmitter Radiated Spurious and Harmonic Emissions:
Test performed at Florida Motorola Labs Inc.

The calibration of this equipment is performed at regular intervals.

METHOD OF MEASUREMENTS

1) **RF Power Vs. DC Power Input (FCC Rules Part 2.985)**
The transmitter was operated under normal conditions at the specified nominal DC input voltage. The antenna output was terminated in 50 ohms. An Ammeter was placed in the input path to measure input current. The input power was calculated from the product of the DC current (in amps) times the DC voltage (in volts). The measurement was performed at the upper and lower limits of the frequency range, for both high and low power settings.

2) **Transmitter Audio Frequency Response (FCC Rules Part 2.987(a))**
An audio oscillator was connected to the microphone audio input of the transmitter. At a frequency of 1khz, the level was adjusted to obtain 20% of full system deviation, to ensure that limiting did not occur at any frequency in the 300 - 3000 Hz range. A constant input level was then maintained and the oscillator frequency was varied between the range of 100 Hz. to 100Kz. The transmitter output was monitored with an HP8901B modulation analyzer, whose FM demodulator output was monitored with an audio analyzer. De-emphasis or filtering within the test equipment is not used. The audio oscillator signal was derived from the HP8903B audio analyzer. This response measurements is linear at all frequencies, therefore the response above 3000 Hz is not attenuated as rapidly as would be the case with an in-limit response above 3000 Hz as used in EIA - 152C section 7.3. However, this method does not produce a response discontinuity at 3000 Hz.

FCC Limits:
Minimum Standard - The audio frequency response shall not vary more than +1 or -3 dB from 300 to 3000 Hz as referenced to 1000 Hz level (with the exception of a permissible 6 dB/octave roll off from 2500 to 3000 Hz).

3) **Transmitter Audio Post - Limiter Low Pass Filter Response (FCC Rules Part 2.987(a))**
The audio oscillator portion of an HP8903B audio analyzer was connected to the input of the post-limiter low-pass filter. The HP8903B audio analyzer monitored the output of the filter, at the point where the signal is applied to the modulator's input. The response was swept between the limits of 100 Hz and 100 kHz. The Oscillator level was chosen to be the highest possible, which will not cause limiting at any frequency, and was maintained constant vs. frequency.

FCC Limits -- Per Applicable Rule Parts
Frequencies between 3KHz and 15KHz shall be attenuated greater than the attenuation at 1Kz by 40 log10 (f/3) dB.
Frequencies above 15KHz shall be attenuated 28 dB.

4) **Modulation Limiting Characteristic (FCC Rules Part 2.987(a))**
The audio oscillator was connected to the microphone audio input. The transmitter output was monitored with an HP8901B modulation analyzer, whose non-de-emphasized FM demodulator output was applied to an HP8903B audio analyzer. The modulation analyzer's 20 kHz low pass filter was used to reduce the level of residual high frequency noise. The oscillator level was adjusted, at 1 kHz, to obtain 60% of full system deviation. The oscillator level was then varied over a range of +/- 25 dB and the resulting deviation was plotted. This measurement was repeated at 300 Hz and 3 kHz.

FCC Limits:
Minimum Standard - The transmitter modulation must not exceed rated system deviation at any frequency input or reasonable change in input level.

5) **Occupied Bandwidth (FCC Rules Part 2.989)**
An audio oscillator was connected to the microphone input. The frequency was set to 2500 Hz and the amplitude was 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 modulating circuit, in accordance with FCC rules Part 2.989(a)(1). The transmitter output is connected, via a suitable attenuator, to an HP8568A spectrum analyzer. 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 modulated signal applied.

FCC Limits -- Per 90.210 (a) (1), (2), (3)
Emission Mask D – 12.5kHz channel bandwidth. For Transmitters that are equipped with an audio low-pass filter.

Measured Data: (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43+10 \log_{10}(P)$ dB.

6) **Conducted Spurious Emissions (FCC rules Part 2.991)**
The output of the transmitter was connected, via a suitable attenuator, to the input of an HP8561B spectrum analyzer. After a carrier reference level was established, a tunable notch filter was inserted between the attenuator and the spectrum analyzer to allow suppression of the carrier. This data was measured from the lower frequency limits up to the tenth harmonic.
FCC Limits -- Per Applicable Rule Parts
Conducted spurious emissions shall be attenuated below the maximum level of emission of the carrier frequency in accordance with the following formula:

For 12.5kHzChannel Bandwidth:
Spurious attenuation in dB = $43+10 \log_{10}$ (Power output in watts) or –20dBm

7) **Radiated Spurious Emissions (FCC Rules Part 2.993)**
Transmitter radiated spurious emissions were measured at an open field test site constructed in accordance with Appendix B, FCC/OST 55 (1982). The measurement performed is the equivalent of the FCC Code of Federal Regulations, Title 47, Part 2, Paragraph 2.993. The tests were conducted at Ultra Tech RFI Labs Inc.

FCC Limits -- Per Applicable Rule Parts
Radiated Spurious emissions shall be attenuated below the maximum level of the emission of the carrier frequency in accordance with the following formula:
For 12.5 kHz channel bandwidth:
Radiated spurious emissions in dB = $43+10 \log_{10}$ (Power output in watts) or –20dBm

8) **Frequency Stability Vs Temperature (FCC Rules Part 2.995)**
Frequency measurements were made at the extremes of the temperature range –30 to +60 degrees centigrade and at intervals of not more than 10 degrees centigrade. Sufficient time was allowed prior to each measurement for the circuit components to stabilize.

FCC Limits -- Per 90.213 and Applicable Rule Parts
Temperature - Frequency Stability of +/- 0.00015% from -30 to +60 degrees centigrade (-20 to +50 degrees centigrade Maritime parts 81 & 83).

9) **Frequency Stability Vs. Voltage (FCC Rules Part 2.995)**
The supply voltage was varied from 80% to 120% of the nominal value.
FCC Limits -- Per 90.213 and Applicable Rule Parts
Power Supply Voltage - Frequency Stability of +/- 0.00015% from 85% to 115% of nominal voltage. (See CRF Rule Part 90.213)

EMISSION DESIGNATOR INFORMATION

Emission Designator for equipment: **FCC ID: AZ489FT5803**

Employing Carson's rule for FM modulation, the required bandwidth for 2.5kHz deviation system is as follow.

i) For a 2.5kHz Deviation System

BW = 2(M+D) = 2(3 +2.5) = 2(5.5) = 11 kHz.

Emission Designator **11K0F3E** (Voice)