1 RF POWER OUTPUT

1.1 Test Instrumentation

[x] Hewlett Packard HP8546A EMI Receiver
[x] Hewlett Packard HP8566B Spectrum Analyzer (S.A.)
[x] EMCO 3141 Bi-Log Antenna
[x] Fluke 6082A Signal Generator
[x] Robert Dipole Antenna
[x] Hewlett Packard 436A Power Meter with Hewlett Packard 8481A Power Sensor
[x] Hewlett Packard 8491B 10 dB attenuator
[x] Pasternack 6 dB attenuator, PE7019-6
[x] Kalmus 737LC RF Amplifier

2 MODULATION CHARACTERISTICS

2.1 Test instrumentation

[X] Hewlett-Packard 8901 Modulation Analyzer
[X] Hewlett-Packard 8904A Multifunction Synthesizer
[X] Leader LFG-1300S Function Generator
[X] Fluke 8060A True RMS Millimeter

3 OCCUPIED BANDWIDTH

3.1 Test instrumentation

[X] Leader LFG-1300S Function Generator
[X] HP 8566B Spectrum Analyzer
[X] Computer

4 TRANSMITTER CONDUCTED SPURIOUS EMISSIONS

4.1 Test instrumentation

[X] HP 8546A EMI Receiver
[X] Pasternack 6 dB Attenuator, PE7014-6
[X] Hewlett-Packard 8491B, 20 dB Attenuator
[X] Topward Power Supply

5 TRANSMITTER RADIATED SPURIOUS EMISSIONS

5.1 Test instrumentation

[X] HP 8546A EMI Receiver
[X] Pasternack 6 dB Attenuator, PE7014-6
[X] Hewlett-Packard 8491B, 20 dB Attenuator
[X] Topward Power Supply
[X] Boonton 4232 Power Meter
[X] HP 83620 B Signal Generator
[X] Roberts Tunable Dipole Antenna
[X] Roberts Tunable Dipole Antenna

6 FREQUENCY STABILITY

6.1 Test instrumentation

[X] Envirotronics Temperature Chamber
[X] Leader LDC-825 Frequency Counter
[X] Hewlett-Packard 8566B Spectrum Analyzer
[X] Topward TPS-4000 DC Power Supply

7 TRANSIENT FREQUENCY BEHAVIOR

7.1 Test instrumentation

[X] Tektronix TDS3012 Two Channel Color digital Phosphor Oscilloscope
[X] Hewlett-Packard 436A Power Meter with Hewlett-Packard 8481A Power Sensor
[X] Hewlett-Packard 8901 Modulation Analyzer
[X] Hewlett-Packard 8491B, 20 dB Attenuator
[X] Hewlett-Packard 8491B, 10 dB Attenuator
[X] Fluke 6071A Signal Generator
[X] Pasternack 3 dB Attenuator, PE7000-3
[X] Pasternack 6 dB Attenuator, PE7000-6
[X] Pasternack 6 dB Attenuator, PE7019-6
[X] Pasternack RF Detector, PE8000-50
[X] Narda Bi-directional Coaxial Coupler, Model: 3020A
[X] Mini-circuits ZFRSC-2050 Power Splitter

8 RF POWER OUTPUT

8.1 Test Procedure

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane on an open test site.

The radiated emission at the fundamental frequency was measured at 3m distance with a test antenna and spectrum analyzer. During the measurement, the resolution and video bandwidth of the spectrum analyzer were set at 120 kHz. To maximize emissions, the system was rotated through 360°, the antenna height was varied from 1m to 4m, and the antenna polarization was changed (horizontal and vertical).

Signal substitution method was used to measure the effective radiated power (ERP). For reference, in addition to the signal substitution method, conducted method was used.

9 MODULATION CHARACTERISTICS

9.1 Test Procedure

9.1.1 Audio Frequency Response

The RF output of the transceiver was connected to the input of a modulation analyzer through sufficient attenuation so as not to overload the analyzer or distort the readings. An audio signal generator was coupled into the external microphone jack of the transceiver, or alternatively, the microphone element was removed and the generator output was connected to the microphone connectors.

The audio signal input level was adjusted to obtain 20% of the maximum rated system deviation at 1 kHz, and recorded as DEV_{REF}. With the audio signal generator level unchanged, set the generator frequency between 300 Hz to 5000 Hz. The transmitter deviations (DEV_{FREQ}) were measured and the audio frequency response was calculated as

9.1.2 Audio Low-Pass Filter Response

An audio signal generator and an audio spectrum analyzer were connected to the input and output of the post limiter low pass filter respectively. The audio signal generator frequency was set between 1000 Hz and the upper low pass filter limit. The audio frequency response at test frequency was calculated as

$$LEV_{FREQ} - LEV_{REF}$$

9.1.3 Modulation Limiting

With the same setup as section 4.2.1 above, at three different modulating frequencies, the output level of the audio generator was varied and the FM deviation level was recorded.

10 OCCUPIED BANDWIDTH

10.1 Test Procedure

The antenna was disconnected from the transmitter and the short cable was connected to the transmitter RF output.

The RF output was connected to the input of the spectrum analyzer through sufficient attenuation.

The resolution bandwidth and video bandwidth of the spectrum analyzer was set at 300 Hz. With the transmitter keyed, the level of the unmodulated carrier was set to the full scale reference line of the spectrum analyzer. This is used as a 0dB reference for emission mask measurements.

The transmitter was then modulated with a 2500 Hz tone at an input level 16 dB greater than the necessary to produce 50% of rated system deviation. The resolution bandwidth of the spectrum analyzer was set to 300 Hz and the spectrum of the transmitting signal was recorded. This spectrum was compared to the required emission mask.

11 TRANSMITTER CONDUCTED SPURIOUS EMISSIONS

11.1 Test Procedure

The antenna port of the EUT was connected to the spectrum analyzer through a 20 dB attenuator. The EUT was powered by a DC power supply through a Motorola supplied test fixture.

12 RANSMITTER RADIATED SPURIOUS EMISSIONS

12.1 Test Procedure

The transmitter was placed on a wooden turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3 orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

The spurious harmonic attenuation was measured as the difference between ERP in dBm at the fundamental frequency and at the spurious emission frequency.

Spurious attenuation in dB = 43 +10Log_{10}(power out in Watts)

13 FREQUENCY STABILITY

13.1 Test Procedure

The ppm frequency error of the transmitter was calculated by:
Where MCF is the Measured Carrier Frequency in MHz
ACF is the Assigned Carrier Frequency in MHz

13.1.1 Frequency Stability vs. Temperature

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber. After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

13.1.2 Frequency Stability vs. Voltage

At room temperature (25 +/- 5^{o} C), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage.

14 TRANSIENT FREQUENCY BEHAVIOR

14.1 Test Procedure

Test setup was configured according to the paragraph 2.2.19 of the TIA/EIA 603-1. A digital oscilloscope was used to capture the transient response.

15 EMISSIONS DESIGNATOR CALCULATION

Employing Carson's rule for the FM modulation, the required bandwidth for 5 and 2.5 kHz deviation systems is as follows.

i) For a 5 kHz Deviation System

BW = 2(M+D)= 2(3+5) = 2(8) = 16kHz.

Emission Designator 16K0F3E

ii) For a 2.5 kHz Deviation System

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

Emission Designator 11K0F3E