MEASUREMENT TECHNIQUES

2.991 Measurements Required: Conducted Spurious and Harmonic Emissions at Antenna Terminals

Graph Attached
EXHIBIT NO. s 9C-1,2,3

Definition - (as used herein) Spurious radiation is the radio frequency voltages or power generated within the equipment and appearing at the equipment's output terminals when properly loaded with its characteristic non-radiating artificial load.

Minimum Standard – The mean power of conducted spurious and harmonic emissions shall be attenuated below the mean output power of the transmitter by:

Frequency Offset	Attenuation (per 4 kHz)
20.833 to 41.667 kHz	25 dBc
41.667 to 104.16 kHz	35 dBc
>104.16 kHz	43 + 10log (Tx Pwr)

In the range of frequencies between 1559 to 1605 MHz, emissions shall not exceed an EIRP density level of -70 dBW/MHz (-40 dBm/MHz) averaged over any 20 ms period and –80 dBW (-50 dBm) for any discrete (BW <600 Hz) spurious emission.

Method of Measurement - The transmitter was modulated with DE-QPSK modulation using pseudo random data. The spectrum was scanned from 30 MHz to the tenth harmonic of the carrier. The level of the carrier and the various conducted spurious and harmonic frequencies were measured by means of a calibrated receiving system. All signals were measured with peak detection (worst case) except at frequencies 50% to 250% where an average measurement was taken using an external frame trigger from the UUT.

2.993 Measurement Required: Radiated Spurious and Harmonic Emissions.

Graph Attached
EXHIBIT NO. 9D

Definition - Radiated spurious and harmonic emissions from the equipment at a frequency or frequencies which are outside an occupied band sufficient to insure transmission of information of required quality for the class of communication desired. The reduction in the level of these spurious emissions will not effect the quality of information being transmitted.

Minimum Standard - The mean power of conducted spurious and harmonic emissions shall be attenuated below the mean output power of the transmitter by:

Frequency Offset	Attenuation (per 4 kHz)
20.833 to 41.667 kHz	25 dBc
41.667 to 104.16 kHz	35 dBc
>104.16 kHz	43 + 10log (Tx Pwr)

In the range of frequencies between 1559 to 1605 MHz, emissions shall not exceed an EIRP density level of -70 dBW/MHz (-40 dBm/MHz) averaged over any 20 ms period and –80 dBW (-50 dBm) for any discrete (BW <600 Hz) spurious emission.

Method of Measurement:

Test Site - All final testing reported herein was performed at the Motorola SSG open air test site (OATS), located at 8201 E. McDowell Rd., Scottsdale, AZ. 85252. The OATS is located on the roof of the building and is built in accordance with ANSI C63.7. The facility has been found to be in compliance with the requirements of Section 2.948 of the FCC rules, per FCC letter 31040/SIT dated November 2, 1995. The facility has also been issued a Certificate of Accreditation through the National Voluntary Laboratory Accreditation Program (NVLAP) by NIST. This is under NVLAP Code: 100405-0 and is effective through September 30, 1999.

Installation of Equipment:

The equipment under test is placed on the turntable in normal operation using the intended power source. A receiving antenna located 3 meters from the turntable picks up any signal radiated from the transmitter and its operating accessories. The antenna is adjustable in height from 1 to 4 meters and can be horizontally and vertically polarized. An HP8566B spectrum analyzer system is used to scan the applicable frequency range to detect and measure any radiation picked up by the antenna. Preliminary radiated emission scans are conducted in a semi-anechoic enclosure in order to isolate emissions in an ambient free environment.

Measurement Procedure:

The procedures of ANSI 63.4 are followed for radiated emission measurements. The equipment under test is adjusted to obtain peak readings of received signals wherever they occur in the spectrum by:

1. Rotating the transmitter under test.

2. Adjusting the antenna height and polarization.

The testing procedure is repeated for both horizontal and vertical polarization of the receiving antenna. The radiated signal strength is derived from the received power levels and measured antenna factors. Also included in the field strength derivation are the cable losses and any other corrections for external attenuation and/or pre-amplification. The final measurement field strengths are recorded on the attached graphs.

2.993 Measurement Required: Frequency Stability

Graph Attached
EXHIBIT NO. 9E, 9F

Definition - The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency

Minimum Standard - The minimum frequency stability shall be +/- 0.00015% (1.5 ppm) at any time during normal operation.

Method of Measurement: Frequency measurements shall be made at the extremes of the temperature range -30 to +60 degrees C and at intervals of not more than 10 degrees throughout the range. A period of time sufficient to stabilize all of the components in the equipment shall be allowed prior to each frequency measurement. The frequency stability of the transmitting equipment shall be checked with variations in:

(a) Temperature
Vary ambient from -30 to +60 C

Graph attached
Exhibit 9E

(b) Primary Supply Voltage:
Vary the primary supply from 3.0 V to 4.1 V at the input to the power cable supplied or at the power supply terminals if cables are not normally supplied.

Graph attached
Exhibit 9F

TIMING PERIOD AND PROCEDURE

1. The carrier frequency of the transmitter and individual oscillators was measured at room temperature (between 25 and 27 C) to provide a reference.

2. Measurements were started at room temperature and subsequently made at each 10 degree interval in positive and negative temperature increments. A period of 60 minutes was allowed between temperature soaks to allow stabilization of the equipment between successive measurement intervals.