GENERAL INFORMATION

1. Production Plans - Pursuant 2.983(c)

   Quantity production is planned.

2. Application References - Pursuant 2.1061

   Reference is made to the following Motorola "Application References" on file with the Commission.

   None.

3. Data Submittal Procedure - Pursuant 2.999, 2.947

   Data is supplied in accordance with Part 2, Subpart J of the Commission's rules.

   Standards used on measurements supplied are TIA/EIA IS-88, TIA/EIA IS-90, TIA/EIA IS-95-A, TIA/EIA IS-98 and OST 53.

4. Similar to "Currently Type Accepted Transmitter Type(s):"

   FCC ID: IHDT5XA1

   This transceiver is based on the same design as FCC ID: IHDT5YD1, (type acceptance granted September 29, 1998). The primary difference is that this device has been repackaged mechanically to be inserted into an IRIDIUM® communications system handset (see Exhibits 7 and 11) and can function as a self contained RF transceiver module to provide alternative terrestrial cellular service to the handset. All power and user interface functions (transmit and receive audio, keypad operations and display) are provided by the IRIDIUM® handset

5. Report of measurements pertaining to types of emission, frequency range, maximum output power and modulation techniques for CDMA and Narrow Analog Modes of Operation (reference paragraphs 31 and 32 of the Report and Order in FCC GEN. Docket No. 87-390).

   The "Motorola NAMPS Air Interface Specification", referenced in Motorola's earlier applications for equipment capable of Narrow Analog Mode Operation, has been replaced. Through the efforts of the Telecommunications Industry Association's TR-45.1 Subcommittee on Analog Cellular, TIA/EIA Interim Standard IS-88 - "Mobile Station - Land Station Compatibility Standard for Dual-Mode Narrow band Analog Cellular Technology" (TIA/EIA IS-88) and TIA/EIA Interim Standard IS-90 - "Recommended Minimum Standard for 800 MHz Dual-Mode Narrow band Analog Cellular Subscriber Units" (TIA/EIA IS-90), both dated January 1993, were developed and, as they apply to cellular subscriber equipment, are incorporated herein by reference.

A. Types of emission

This equipment continues to be capable of the existing, approved emissions for previously existing equipment designed and approved for operation in the Domestic Public Cellular Radio Telecommunications Service in the Wide Analog Mode.

In the Narrow Analog Mode, a new emission designator **17K4F9W** is added, determined as explained in section 6 of this exhibit. Reference is also made to TIA/EIA IS-88 and TIA/EIA IS-90.

Actual measurements of Occupied Bandwidth for the Narrow Analog Mode are shown in Exhibits 9F-5 and 9F-6.

In the Digital CDMA Mode, a new emission designator **1M25F9W** is added, determined as explained in section 6 of this exhibit. Reference is also made to TIA/EIA IS-95-A.

Actual measurements of Occupied Bandwidth for the Digital CDMA Mode are shown in Exhibit 9F-7.

Spurious Emissions (Conducted and Radiated) reported in Exhibits 9G and 9H are the worst (highest level) of Wide, Narrow and Digital Modes.

B. Frequency range

The frequency range of the equipment is the Domestic Public Cellular Radio Telecommunications Service bands, 824 - 849 MHz and 869 - 894 MHz, regardless of whether in Wide, Narrow or Digital Mode. In Wide Analog Mode, the channel spacing is 30 kHz on signaling channels and voice channels. In Narrow Analog Mode, however, the channel spacing is 10 kHz on voice channels. In Digital CDMA Mode, the channel increment is 30 kHz for all data and voice channels although centers of adjacent CDMA channels are typically spaced a minimum of 1.23 MHz apart as well as minimum of 0.69 MHz away from the band edges. Again, reference is made to TIA/EIA IS-88, TIA/EIA IS-90, TIA/EIA IS-95, and EIA/TIA IS-98.

Frequency Stability versus Temperature and Voltage measurements is shown in Exhibits 9J-1,2,&3 and 9K-1,2&3. This equipment uses Automatic Frequency Control (AFC) to lock to within 0.75 part per million (steady state) of the frequency received from the Land Station system for Analog Mode, and to within ± 300 Hz of the received frequency from the Land Station system for Digital Mode. Also refer to Exhibit 6A.

C. Maximum output power

<u>Analog Mode</u>

Radio Frequency Output Power is independent of whether the equipment operates in the Wide or Narrow Mode. Power output capability of the Mobile Station equipment is still reported to the Land Station system (via the Mobile Station Power Class in the Station Class Mark) and the Mobile Station will respond to

commands from the Land Station system to change power levels as defined in the specifications.

Digital Mode

The maximum radio frequency power allowed per the standard ranges from 0.2 Watts to 1.0 Watt. The mobile maximum output power during a power control group is within the specified limits and is controlled by commands from a Land Station system.

R. F. Output Power measurement results are shown in Exhibit 9A.

D. Modulation techniques

Analog Mode

Modulation in the Narrow Mode is conventional Frequency Modulation with peak frequency deviation lower than that of Wide Mode. The highest modulating frequency is also reduced in Narrow Mode by replacing the nominal 6 kHz Supervisory Audio Tone (SAT) and 10 kHz Signaling Tone (ST)/Data signals of Wide Analog Mode with a 200 bit/second Digital SAT (DSAT) or Digital ST (DST) signal or 100 Manchester bit/second Data signal to accomplish the supervision, signaling and command/control functions between the Mobile and Land stations. The highest modulating frequency is then the maximum voice path frequency, 3000 Hz. The peak deviation of the voice signal for Narrow Mode is 5 kHz. The peak deviation of the DSAT, DST or Data signal for Narrow Mode is 0.7 kHz. The end result is that less bandwidth is needed to accomplish communications in Narrow Mode than in Wide Mode. Reference is again made to TIA/EIA IS-88 and TIA/EIA IS-90, for further details.

Exhibits 9B-2, 9D-2, 9E-3 & 4 and 9F-5 & 6 show the results of modulation related testing (pursuant to Sections 2.987 and 2.989 of the Commission's rules) for the Narrow Mode.

Digital CDMA Mode

Modulation in the Digital Mode is OQPSK (Offset Quaternary Phase Shift Keying). Reference is made to TIA/EIA IS-95-A, Section 6.

Exhibits 6C and 6D further discuss details of the modulating circuitry.

Exhibit 9F-7 shows the results of modulation related testing (pursuant to Sections 2.987 and 2.989 of the Commission's rules) for the Digital Mode.

Exhibit 6F discusses digital modulation techniques used in both digital and analog modes.

6. Determination of Emission Designators for Additional Modes of Operation (per Part 2 - Subpart C of the Commission's rules)

A. Emission, modulation and transmission characteristics (per section 2.201)

Narrow Analog Mode

i. First Symbol - Type of modulation of the main carrier.

The main carrier is Frequency Modulated in the Narrow Mode.
This corresponds to the symbol **F**.

ii. Second Symbol - nature of signal(s) modulating the main carrier.

One Analog signal representing the voice or other audio signals in the frequency range from 300 to 3000 Hz and one Digital signal representing command data, Digital Signaling Tone (DST) or Digital Supervisory Audio Tone (DSAT) modulate the main carrier in the Narrow Mode.
This corresponds to the symbol **9**, defined as "Composite system with one or more channels containing quantized or digital information, together with one or more channels containing analogue information."

iii. Third Symbol - type of information to be transmitted.

The information transmitted in the narrow mode is a combination of data transmission (the command data, DSAT or DST) and telephony (the voice or other audio signals).

This corresponds to the symbol **W**, defined as "Combination of the above" which would be the combination of symbol **D**, "Data transmission, telemetry, telecommand," and symbol **E**, "Telephony (including sound broadcasting)."

Digital CDMA Mode

iv. First Symbol - Type of modulation of the main carrier.

The main carrier is Offset Quaternary Phase Shift Keyed (OQPSK) and has both amplitude and angle modulation characteristics during the digital mode of operation. OQPSK in and of itself does not necessarily produce amplitude modulation characteristics, however, the In-Phase (I) channel and the Quadrature (Q) channel modulating signals are filtered by a 47 tap FIR filter specified in TIA/EIA IS-95-A, section 6 before being applied to a quadrature modulator. The filtering produces amplitude variation on the main carrier. In addition, the carrier is gated on and off at a rate determined by the transmission data rate as specified in TIA/EIA IS-95-A, section 6. Therefore,

the main carrier is not a constant envelope signal, but is both amplitude and angle-modulated.

This corresponds to the symbol D, defined as "Emissions in which the main carrier is amplitude and angle-modulated either simultaneously or in a preestablished sequence."

v. Second Symbol - nature of signal(s) modulating the main carrier.

One Digital Signal representing sampled, quantized voice or other audio information or data modulates the main carrier using direct sequence CDMA techniques during the digital mode of operation.

This corresponds to symbol 1, defined as "A single channel containing quantized or digital information without the use of a modulating sub-carrier, excluding time division multiplex."

vi. Third symbol - Type of information to be transmitted.

The information transmitted in the digital mode of operation is a combination of data transmission (command data) and telephony (sampled quantized voice or other audio signals).

This corresponds to symbol W, defined as "combination of above" which would be the combination of symbol D, "Data transmission, telemetry, telecommand," and symbol E, "Telephony (including sound broadcasting)."

B. Bandwidths (per section 2.202)

Narrow Analog Mode

To determine the necessary bandwidth (B_n) for transmitters employing frequency modulation, the formula: $B_n = 2M + 2DK$, generally applies. In the formula, M is the maximum modulation frequency in hertz, D is the peak frequency deviation in hertz and K is a variable factor, typically equal to 1 (or slightly greater).

For narrow mode operation: the maximum modulating frequency (M) is 3000 Hz; the peak frequency deviation (D) is 5.7 kHz or 5700 Hz, from 5 kHz peak frequency deviation for the analog information and 700 Hz peak frequency deviation for the digital information; K is chosen to be 1 since the predominant transmitted signal is telephonic in nature (which indicates a typical value of 1 for K in section III-A.2. of the Table in paragraph 2.202(g)) and the nature of the digital information is highly tolerant to distortion.

The calculation is then: 2 * 3000 Hz + 2 * 5700 Hz * 1 = 17400 Hz.

Converting 17400 Hz to the format in paragraph 2.202(b), yields **17K4**.

The resulting complete Emission Designator for Narrow Mode is then **17K4F9W**.

The current Emission Designators for the Wide Mode, 40K0F1D and 40K0F8W, are included since the equipment also still operates in the Wide Mode.

Digital CDMA Mode

Bandwidth is primarily determined by a 47 tap FIR filter used to filter the I channel and Q channel modulating signals. Per TIA/ EIA IS-95-A Section 6.1.3.1.10, the filter is defined to have a one-sided 1.5 dB ripple bandwidth of 590 kHz minimum and a 40dB minimum stopband at 740 kHz maximum. Computer simulations show that the occupied bandwidth as defined in paragraph 2.202(a) is 1.25MHz.

Based on these considerations, the bandwidth used is 1.25 MHz.

Converting this result to the format indicated in paragraph 2.202(a), yields **1M25**.

The resulting complete emission designator for the Digital CDMA mode of operation is then **1M25F9W**.

The current Emission Designators for the conventional analog mode, 40K0F1D and 40K0F8W, are included since the equipment also operates in the conventional analog mode.