DESCRIPTIVE INFORMATION AND ANTENNA DATA

FCC FILING FOR CDMA FIXED WIRELESS TERMINAL (FWT)

The information in this exhibit is in accordance with the FCC Rules and Regulations, Vol. I, Part 2, Subpart J (10-1-96 Edition). Sections 2.983 through 2.999 are addressed.

Section 2.983 (a) **Name of Applicant and Manufacturer:** MOTOROLA

Section 2.983 (b) **Identification of Equipment:**

FCC ID: IHET6ZD1

MODEL: ST1001B

Section 2.983 (c) **Quantity Production:** Quantity Production is Planned.

Section 2.983 (d) **Technical Description**

This Transmitter is intended for use in the Cellular Radiotelephone Service and is designed in compliance with the Code of Federal Regulations Title 47 Part 24 Subpart E and parts of J-STD-018 pertaining to CDMA mode. Additionally, this transmitter is capable of spread spectrum (CDMA) operation.

(1) **Types of Emissions**

This equipment will be capable of operation using wide band spread spectrum techniques employing Direct Sequence Code Division Multiple Access (DS-CDMA) digital communication techniques.

For this transmitter, the emission designator is 1M25F9W (per 47 CFR 2.201 and 2.202).

(2) **Frequency Range**

This transmitter operates within the 1850 to 1910 MHz Band (per 47 CFR 24.229). This base station will support CDMA operations on channel numbers 1 through 1199 inclusive.. The lowest frequency channel is 1 and is centered at 1850.05 MHz. The highest channel is 1199 and is centered at 1909.85 MHz. Channel center spacing is at 50 kHz.

(3) **Range of Operating Power**

The range of output power for the FWT is -55 dBm to +27 dBm into a 50 Ohm load.

(4) **Maximum Power Rating**

The maximum power is defined in 47 CFR 24.232 in terms of maximum effective radiated power ERP and is 2 Watts for mobile transmitters. The output power for the FWT is 200 mW and with the antenna gain will be less than 300 milli Watts which is well within the specification.

(5) **Applied voltages and currents into the final transistor elements of the transmitter output:**

Applied voltages and currents into the final transistor elements at 200 mW output:

Collector	+3.8	Vdc
Collector Current	400	mA
Bias	2.8	Vdc

(6) **Function of Each Active Device**

Refer to Parts List/Tune Up Info.

(7) **Complete Circuit Diagrams**

Refer to Schematics.

(8) **Outline of Instruction Manual**

Refer to Users Manual.

(9) **Tune-Up Procedure**

Power and frequency alignment for the FWT is performed at the factory. No field adjustments are necessary.

(10) **Means for Frequency Stabilization**

Refer to Test Report

The reference oscillator is phase-locked to the incoming Forward channel from the base station. The frequency stability is totally dependent on the stability of the base station.

(11) **Means for Attenuation of Spurious Emissions**

Refer to Test Report.

Bandpass duplexers are employed in the RF circuit to attenuate far out spurious emissions.

In addition, suppression of spurious radiated emissions is ob-

tained by proper shielding techniques.

(11) **Means for Limiting Modulation**

Refer to Test Report.

In a CDMA system, the input signal (voice for example) is sampled and coded in a vocoder. The maximum data rate for current vocoders is 13300 bits/second. This signal is then spread to 1.23 MHz by a pseudo-random spreading code. This spreading code sets the bandwidth of the spread-spectrum signal. To some extent, the bandwidth of the transmitted signal is limited by the chip rate of the PN spreading code.

Primary limiting of the CDMA signal bandwidth is accomplished by the use of Finite Impulse Response (FIR) filters**.**

(11) **Means for Limiting Power**

Open loop power control causes a CDMA mobile to monitor the received power from the base station pilot channel and continuously adjust its output power accordingly and linearly.

(12) **Description of Digital Modulation Techniques**

Refer to Test Report.

Data transmitted on the Reverse CDMA Channel is grouped into 20 mS frames. All data transmitted on the Reverse CDMA Channel is convolutionally encoded, using a rate 1/n code of constraint length nine. For Rate Set 1, a rate 1/3 code is used. Symbols are repeated for the lower data rates to obtain a code symbol rate of 28800 sps. For Rate Set 2, a rate 1/2 code is used. After symbol repetition for the lower data rates, the same code symbol rate 28800 sps is obtained.

Groups of six code symbols are used to select one of 64 different orthogonal Walsh functions for transmission. The Walsh function chips are combined with the long and short PN codes. Note that this use of the Walsh function is different than on the Forward CDMA Channel. On the Forward CDMA Channel, the Walsh function is determined by the personal station’s assigned code channel, while on the Reverse CDMA Channel the Walsh function is determined by the information being transmitted. The use of the Walsh

function modulation on the Reverse CDMA Channel is a simple method of obtaining 64-ary orthogonal modulation. The 64-ary demodulation can be done by a Fast Hadamard Transform. The Fast Hadamard Transform is similar to a Fast Fourier Transform except that it requires only additions and subtractions and thus simplifies demodulator implementation. Also note that on the Forward CDMA Channel , the Pilot Channel signal is shared among all the personal stations and is used as a reference for coherent demodulation. The Reverse CDMA Channel uses orthogonal modulation with non-coherent demodulation.

A “channel” on the Reverse CDMA Channel consists of a signal centered on the assigned frequency, offset quadriphase modulated by a pair of PN codes, biphase modulated by a long PN code with address determined code phase, and biphase modulated by the Walsh encoded and convolutionally encoded digital information signal.

Section 2.983 (e) **Standard Test Conditions**

The following conditions and procedures were followed during testing of this transmitter:

Room Temperature	+25 ˚C
Room Humidity	50 %
AC Supply Voltage	120 VAC (Nominal)

Prior to testing, the unit was tuned up according to the Manufacturer’s Alignment Procedure. All data presented represents the worst case parameter being measured. All test data required by 47 CFR 2.985 through 2.997 can be found in theTest Report.

Section 2.983 (f) **Equipment Identification**

A drawing of the equipment identification nameplate appears in the FCC ID number. IHET6ZD1 shall be added at the reserved location once grant is issued. The location of the label will be on the side of the housing of the FWT.

The labeling requirements specified in 47 CFR 15.19 (c) will apply to ST1001B Fixed Wireless Terminal. In particular, the appropriate paragraphs will be placed in the instruction manual.

Section 2.983 (g) **Photographs**

The photographs showing external and internal construction are in External Photographs and Internal Photographs.

Section 2.985(d) Measurements Required: **RF power output**

Refer to Exhibit Test Report.

DEFINITION

The mobile station estimates its open loop mean output power from its mean input power (J-STD-018).

MINIMUM STANDARD

With minimum Forward CDMA Channel power, the FWT shall transmit an output power of +19 dBm to the specified maximum (+27 dBm).

METHOD OF MEASUREMENT

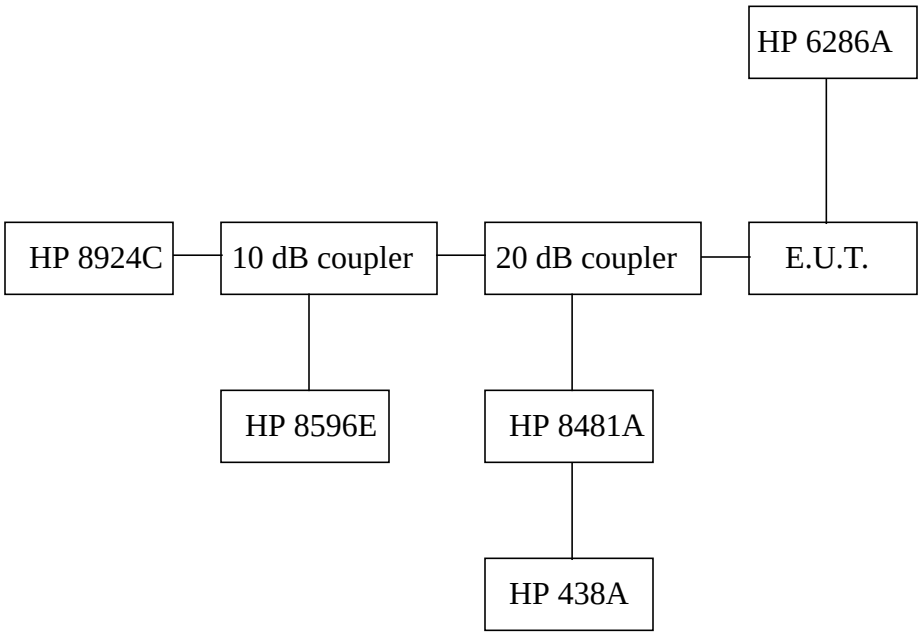

Figure 1: FWT Type Acceptance Test Setup

Using the equipment setup in Figure 1, setup a call with a Forward Link Channel power of -105 dBm (maximum transmit power per 47 CFR 2.985 (a)). Record the output power on a spectrum analyzer HP 8596E

with the CDMA Personality Option HP 85725B. Note the HP 8924C is a 50 Ohm load for the FWT.

Section 2.987(d) Measurements Required: **Modulation Characteristics**

Refer to Test Report. Waveform Quality (ρ)

DEFINITION

Transmit waveform quality is the normalized correlated power between the actual waveform and the ideal waveform. The range of values for the transmit waveform quality is from 1.0, a perfect CDMA waveform, to 0.0, a non-CDMA signal. As an example, a mobile station with a 0.27 dB degradation in its transmit waveform would have a quality (ρ) of 10^(-0.27/10) = 0.94.

MINIMUM STANDARD

The minimum waveform quality figure for a spread-spectrum CDMA signal is 0.944 as measured with a Rho meter. (Per J-STD-018).

METHOD OF MEASUREMENT

Using the setup in Figure 1, setup a call with a Forward Link channel power of -73 dBm, and measure Rho under TX tests.

Section 2.989(c) Measurement Required: **Occupied Bandwidth**

Refer to Exhibit Test Report.

DEFINITION

The occupied bandwidth is the frequency bandwidth of a modulated carrier within which a total of 99% of the rated power appears. Data on the bandwidth occupied by this transmitter is presented in the form of plots taken from a spectrum analyzer. For CDMA, the bandwidth is primarily determined by a 47 tap FIR filter used to filter the I and Q channel modulating signals. Per J-STD-018, the filter is defined to have a one-sided 1.5 dB ripple bandwidth of 590 kHz minimum and a 40 dB minimum stopband at 740 kHz maximum. Computer simulations show that the occupied bandwidth, as defined in 47 CFR 2.202 (a), is 1.25 MHz (emissions designator 1M25). Note that the emissions

designator is defines the minimum value of necessary bandwidth sufficient to ensure the transmission of data (47 CFR 2.202 (b)).

Section 4.5.1 further defines the limitations on emissions for bandwidth occupied as modulation products in a bandwidth of 30 kHz centered ±1.250 MHz from the channel center frequency shall be at least 42 dB below the mean output power level. The definition of occupied bandwidth is the same for both base stations and mobiles.

MINIMUM STANDARD

Following 47 CFR 24 subpart E and 22.901 (d)(2) for alternative technologies and 47 CFR 2.989 (h) and (i) regarding bandwidths, the transmit occupied bandwidth for a spread-spectrum CDMA signal is:

a) Modulation products in a bandwidth of 30 kHz centered 900 kHz from the channel center frequency should be at least 45 dB and shall be at least 42 dB below the mean output power level.

METHOD OF MEASUREMENT

Using the test setup in Figure 1, setup the FWT to transmit a full power. Using a Hewlett-Packard spectrum analyzer HP 8596E with the CDMA Personality Option HP 85725B, measure the occupied bandwidth set at 99% power. The HP 85725B CDMA Personality Option uses J-STD-018 and FCC standards for its measurements such as occupied bandwidth. Exhibit 7 is a spectrum analyzer plot showing the J-STD-018 transmit mask as described above. Exhibit 09 shows a spectrum analyzer plot measuring the occupied bandwidth for 99% rated power for the low, mid, and high channels.

Section 2.991 Measurement Required: **Spurious & Harmonic Emissions at the Antenna Terminals**

Refer to Exhibit Test Report.

DEFINITION

Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside the authorized bandwidth of the transmitter. Reduction in the level of these spurious emissions will not affect the quality of the information being transmitted.

MINIMUM STANDARD

Per 47 CFR 24.238 and J-STD-018, the minimum standards for Transmit Port Conducted Spurious Emissions are as follows:

Transmit Conducted Spurs:

Using a HP 8596E spectrum analyzer set to a resolution bandwidth of 30 kHz, the spurious emissions shall be attenuated below the mean output power according to the following specification:

a) For offset frequencies greater than 1250 kHz from the CDMA Channel center frequency, at least 42 dBc (J-STD-018 SECTION 4.5.1.3).

Using a HP 8596E spectrum analyzer set to a resolution bandwidth of 1 MHz, the spurious emissions shall be attenuated below the mean output power according to the following specification:

b) For all other frequencies not within the operators allocated band, at least 43+10 Log(P) dB or -13 dBm (Per 47 CFR 24.238)

METHOD OF MEASUREMENT

Using the test setup in Figure 1, connect a HP 8596E spectrum analyzer to the RF Transmit Port of the FWT. Setup a call at one of the three channels (low, mid or high), and transmit at full power.

Measure the power level at the carrier frequency. Sweep the spectrum analyzer from 30 kHz to the tenth harmonic of the highest carrier frequency and record all spurious emissions. Exhibit Test Report has a spectrum analyzer plot showing the J-STD-018 transmit mask as described above in (a) and (b).

Note: Exhibit Test Report shows plots for the fundamental and upto 4th harmonic of the low, mid, and high channels. All the other conducted spurious emissions from 30 MHz up to the tenth harmonic were measured below the noise floor. All emissions in the base station frequency range of 1930 TO 1990 MHz were less than -80 dBm..

Section 2.993 Measurement Required: **Field Strength of Spurious & Harmonic Radiation**

Refer to Exhibit Test Report.

DEFINITION

Radiated spurious and harmonic emissions are emissions from the equipment when loaded into a non-radiating load on a frequency or fre-

quencies that are outside an occupied band sufficient to assure transmission of information with required quality for the class of communications desired. The reduction in the level of these spurious emissions will not affect the quality of the information being transmitted.

MINIMUM STANDARD

The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the alignment procedure, shall not be less than 43 + 10*log(mean output power in Watts) dB below the mean power output.

A contracted FCC approved test site was used to measure the radiated emissions. The contracting company was KTL Corporation (ICC) at 802,N.Kealy, Lewisville, TX 75057. (Test report # 900070EUS.).

METHOD OF MEASUREMENT

The equipment 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.

The testing procedure is repeated for both horizontal and vertical polarization of the receiving antenna. Relative signal strength is indicated on meters built into the receiver. To obtain actual radiated signal strength, a standard signal generator with calibrated output is substituted for the transmitter under test. A range of frequencies, covering the spectrum under investigation, are broadcast and measured at the receiver. The path loss is then determined at each of these discrete frequencies based on the received signal power and the transmitted signal power. All affecting factors, such as antenna gain and cable loss, are accounted for. This table of path loss values is then used to convert a signal level measured at the receiver to the value that would be measured at the device (assuming an isotropic radiator). A summary of the worst case channel is shown in Exhibit Test Report.

Section 2.995 Measurement Required: **Frequency Stability**

Refer to Exhibit Test Report.

DEFINITION

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

MINIMUM STANDARD

Under 47 CFR 2.995 (a)(3), the frequency stability shall be measured from -30 to +50 degrees Celsius. 47 CFR 2.995 (d)(1) specifies the frequency stability to be measured while varying the primary supply voltage from 85 to 115 percent of the nominal voltage. For both tests, the frequency error shall be within +/- 150 Hz (J-STD-018).

METHOD OF MEASUREMENT

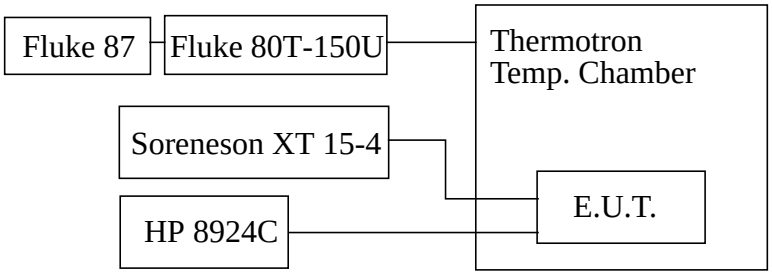

Figure 2: Frequency Stability Test Setup

Using the test setup in Figure 2, setup a call with a Forward Channel power of -73 dBm and measure Frequency Error under the TX tests option. Supply voltage is varied from 85 to 115 percent of the nominal voltage (120 VAC) while at 25 degrees Celsius. In the next test the temperature will be increased at 10 degree intervals from -30 to +50 degrees Celsius (47 CFR 2.995 (b)) and the frequency error of the timebase is measured.

MOTOROLA
Cellular Infrastructure Group

FCC ID: 1HET6ZD1

ANTENNA DATA

MOTOROLA ANTENNA(1.9GHz) SPECIFICATION

1.SCOPE

THIS SPECIFICATION APPLIES TO MOTOROLA-ANTENNA(1.9GHz). THIS DEVICE IS A 90 DEGREE PIVOTING 1/2 WAVE COAXIAL SLEEVE DIPOLE ANTENN. IT IS TO BE USED AS AN ANTENNA FOR ~~FIXED WIRE TERMINAL~~ FIXED WIRELESS LOCAL LOOP TERMINAL AND IS WALL OR DESK MOUNTABLE.

2.APPEARANCE AND CONSTRUCTION

REFER TO ASSEMBLY DRAWING.

3.RATING

OPERATING TEMPERATURE RANGE : FROM -40°C~+85°C.

4.ELECTRICAL PERFORMANCE

NO.	ITEM	SPECIFICATION	NOTE
4-3	RESONANCE FREQUENCY	1.9GHz	
4-4	VSWR	2.7 MAX.	AT 1.9GHz
4-5	GAIN	(-2dBd MIN.)	AT 1.9GHz (REFERENCE)