3.4 TEST CONFIGURATION DETAILS

3.4.1 CDMA Input Signal Description

For all tests, a CDMA waveform generator was used to simulate input from the BTS. The signal generator used was a HP E4432B CDMA signal source. This generator outputs a three carrier waveform having a 3 dB bandwidth of 3.75 MHz about the center frequency, and a crest factor (ratio of peak to average output power) of about 14 dB, which is designed to mimic that of a "fully loaded" CDMA forward signal. The CDMA signal meets the spectral shape and purity requirements of existing PCS CDMA specifications.

The generator was set to the appropriate frequency (same as the CMI transmit frequency). The level was set to +5 dBm (average) per carrier, which is consistent with the maximum output of a conventional Base Transceiver Station (BTS) interface. The forward signal was injected into the system by splitting the signal and injecting it into the three HIC input ports (alpha, beta, and gamma).

3.4.2 CMI Configuration, Radiated Emissions

For radiated emissions tests, the CMI was placed on a flush-mounted wooden turntable. Refer to Figure 3-1. The two CMI receive ports were not connected and the transmit port was connected to an RF load.

3.4.3 HEE Configuration

The Hub Equipment was tested per ANSI C63.4 requirements for floor standing devices. Each HIC and HCU ports not used were not connected as in a normal application and the signal ports were connected to cables tied to the CMI. See Figure 3-2.

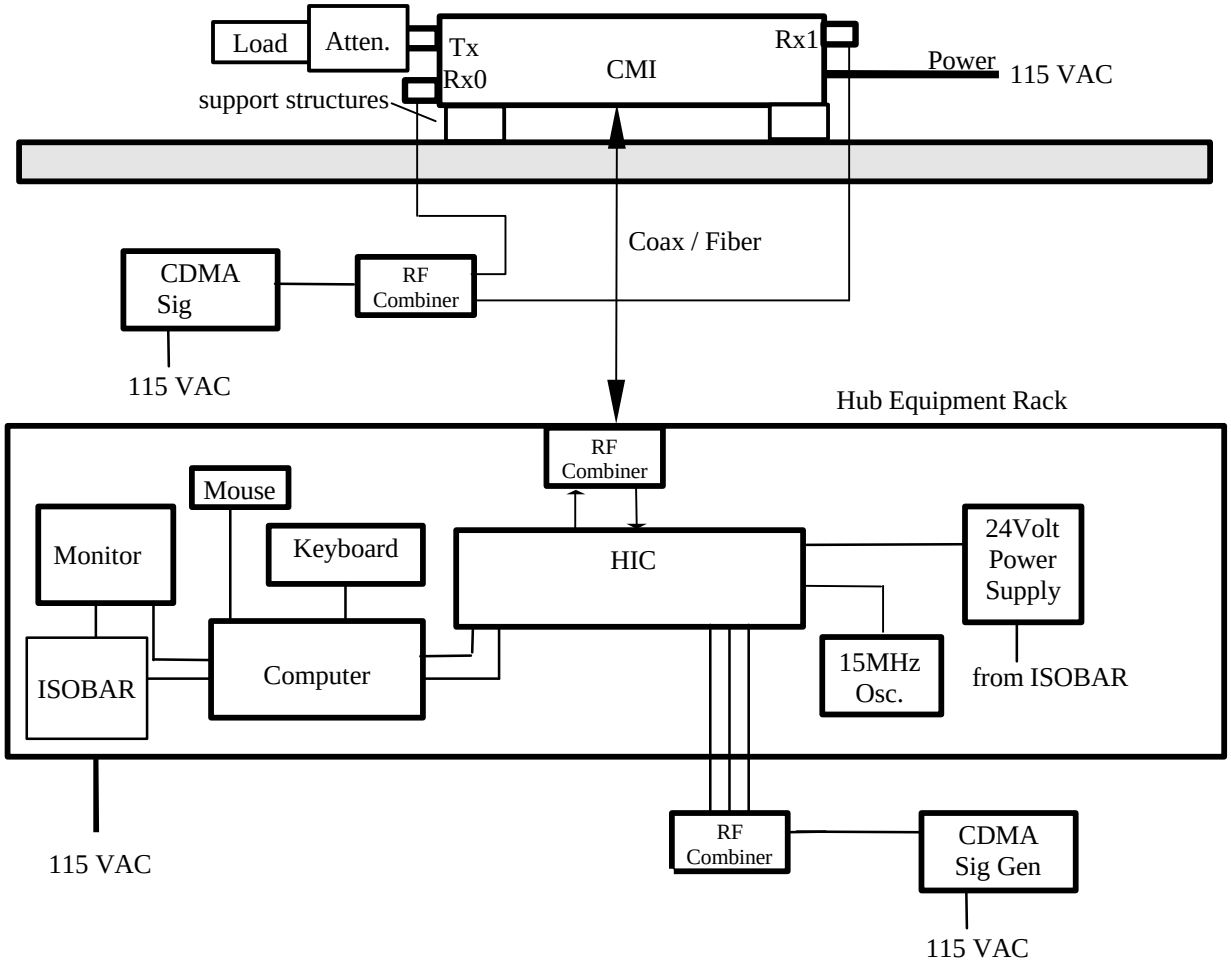

Figure 3-1 CMI Radiated Emissions Test Setup

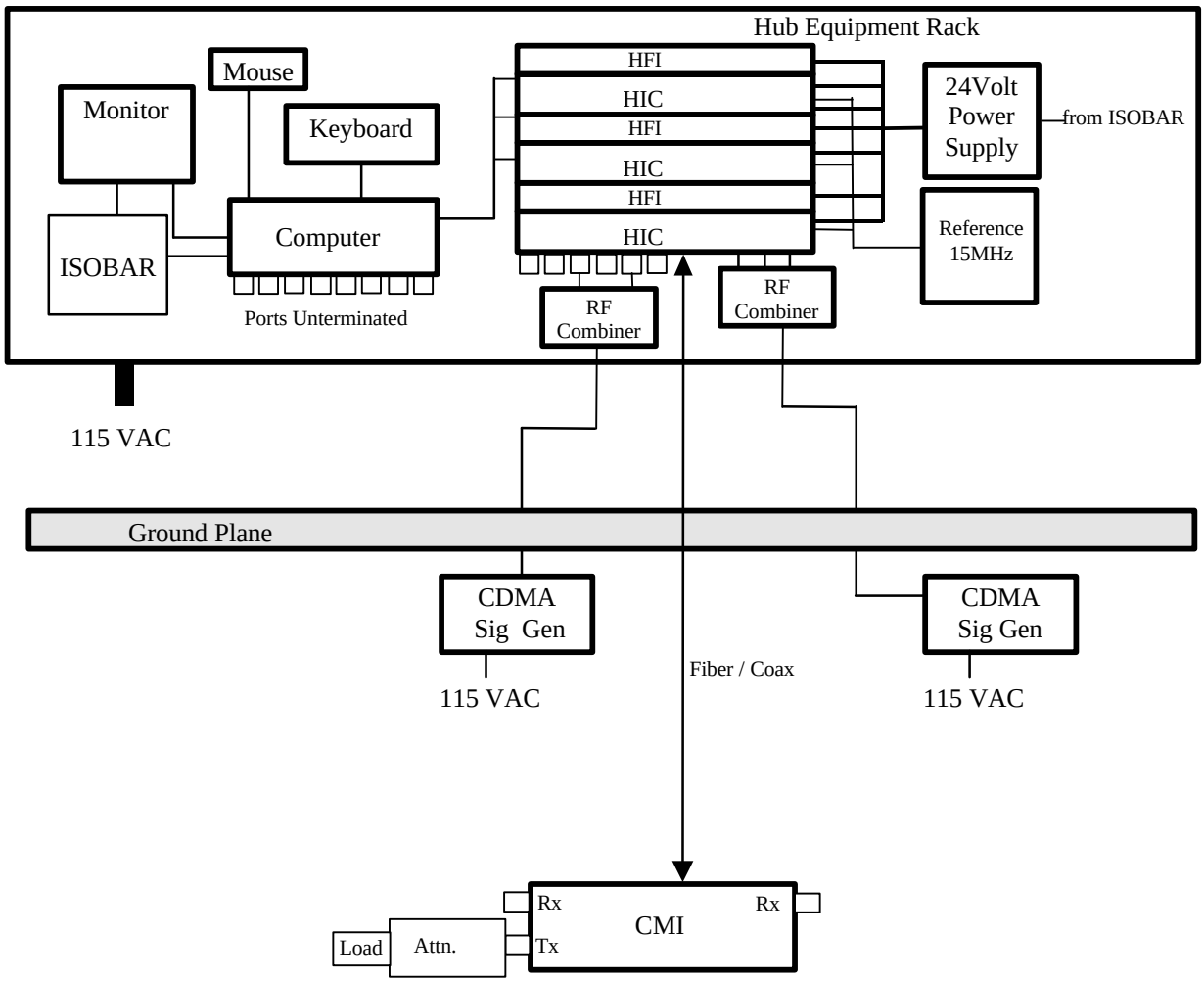

Figure 3-2 Hub Equipment Rack Radiated Emissions Test Setup

Description	Model/Mfr.
Spectrum Analyzer	8560E/HP
CDMA Generator (Rev)	8935C/HP
CDMA Generator (Fwd)	E4432B/HP
Attenuator	64671 2N75W-30-296/Inmet
Load	375BNW/Narda

Table 3-1 Exercise Equipment

4.0 TEST RESULTS

4.1 POWER OUTPUT

4.1.1 Test Procedure

Tests were performed in general accordance with ANSI C63.4-1992. The CDMA generator was used to simulate actual system modulation. Average power was measured directly with the power meter.

The peak power output data was obtained by connecting the transmitter output to a directional coupler and RF load. The coupled port was connected to the spectrum analyzer. A 30 kHz RBW setting was used, and the analyzer was set to peak hold mode.

The average power output data was obtained by connecting the transmitter output of the CMI to the Power Meter through an attenuator and sensor.

4.1.2 Instrumentation Used

Description	Model/Mfr.
CDMA Generator	E4432B/HP
Spectrum Analyzer	8560E/HP
Power Meter	436A/HP
Power Sensor w/ attenuator	8481B/HP
Coupler	3202B-20/ Narda
Load	TRM-2143-M0-SMA-07/Midwest Microwave

4.1.3 Results

Average power, of the composite of the three CDMA signals, as measured with the power meter, is tabulated in column 4 of the table below. The raw spectrum analyzer levels are recorded in column 5. Setup loss in dB is recorded in column 6. Column 7 is the bandwidth adjustment factor, which is necessary to account for the reduction in signal amplitude when using the 30 kHz resolution bandwidth.

Bandwidth correction = $10\log\left[\frac{1.23MHz}{0.03MHz}\right]$ = 16.1 dB.

The peak power in dBm of column 8 was obtained by adding columns 5, 6 and 7. The power in dBm was converted to power in watts by:

P = antilog((D-30)/10)

where: P = power in watts
D = power in dBm

The CMI complies with Part 24 requirements for peak power output when connected to representative system antennas.

Channel	Center Frequency, MHz	Average Power, dBm [1]	Average Power, watts	Analyzer Reading, dBm [2]	Cable and Coupler Loss, dB	Bandwidth Adjustment Factor, dB [3]	Peak Power, dBm	Peak Power, watts
50	1932.5	38.75	7.5	3.17	22	16.1	41.17	13.092
200	1940	38.75	7.5	3.24	22	16.1	41.34	13.614
350	1947.5	38.75	7.5	3.83	22	16.1	41.93	15.596

[1] measured with power meter.
[2] measured with spectrum analyzer in peak, max hold mode, 30 kHz RBW.
[3] Bandwidth factor of 16.1 dB is obtained from 10·log(1.23/0.03).

4.2 OCCUPIED BANDWIDTH

4.2.1 Test Procedure

Tests were performed in accordance with ANSI C63.4-1992. The CDMA generator was used to simulate actual system modulation.

4.2.2 Instrumentation Used

Description	Model/Mfr.
CDMA Generator	E4432B/HP
Spectrum Analyzer	8560E/HP
Coupler	3202B-20/ Narda
Load	TRM-2143-M0-SMA-07 Midwest Microwave

4.2.3 *Results*

Measured occupied bandwidth was 3.93 MHz (three carriers) at the 23 dB down points for all channels tested. At the extreme upper and lower CMI channels, the transmitted signal is well within the PCS block limits. Figures 4-1 and 4-2 show the occupied bandwidth of the three carriers at the edges of each PCS block (A-Band).

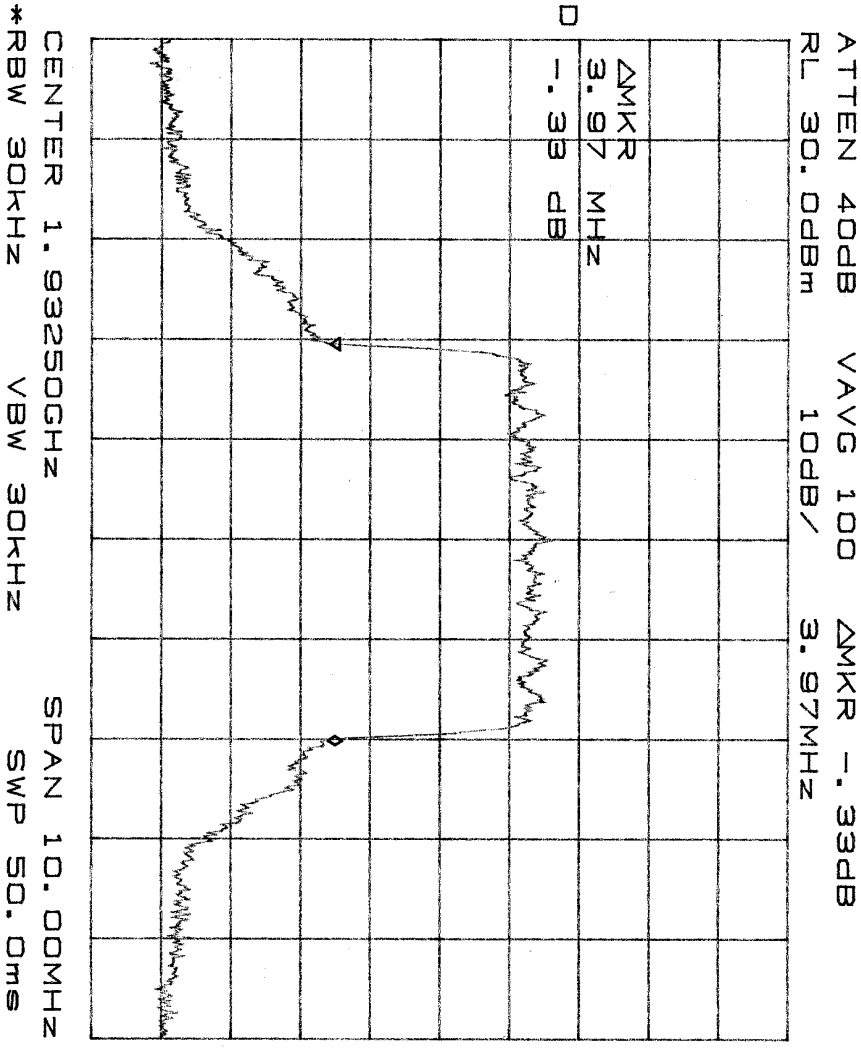

Figure 4-1 Occupied Bandwidth, Channel 50

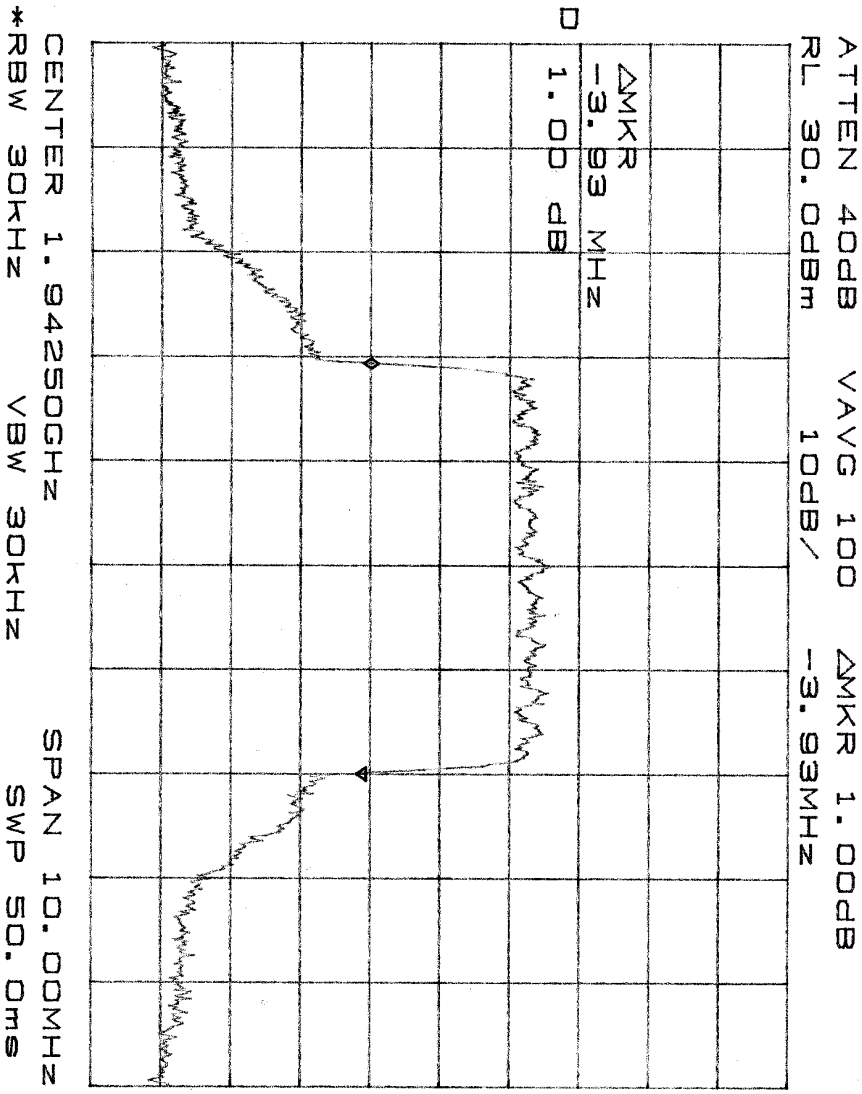

Figure 4-2 Occupied Bandwidth, Channel 250

4.3 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

4.3.1 Test Procedure

Tests were performed in accordance with ANSI C63.4-1992. Per CFR 24.238, all measurements above 1 GHz were performed using average detection and a 1 MHz resolution bandwidth, except at measurement frequencies within the PCS block and 1 MHz beyond the upper and lower PCS block edges, where a 30 kHz resolution bandwidth was used. All measurements below 1 GHz were performed using peak detection and bandwidths per ANSI C63.4-1992.

The CMI power output level was set to the rated maximum (7.5 watts; three carriers) for all measurements.

4.3.2 Instrumentation Used

Description	Model/Mfr.
Spectrum Analyzer	8560E/HP
CDMA Generator	E4432B/HP
Coupler	3202B-20/ Narda
Load	TRM-2143-M0-SMA-07 Midwest Microwave

4.3.3 Results

Per CFR 24.238, out-of-block emissions are required to be a minimum of $43 + 10 \cdot \log(P)$ below the fundamental power, where P is the transmitter power in watts. In terms of an absolute power level, the limit is calculated by:

$P_{lim} = 10 \cdot \log(P) - (43 + 10 \cdot \log(P))$ = -43 dBW = -13 dBm.

All emissions were below the required limit. The highest measured levels are tabulated below. In addition, the occupied bandwidth plots presented in Figures 4-1 through 4-2 show that Part 24 limits are met for PCS transmit channels at the edge of the block.

CMI Transmit Channel (Center Freq)	Spurious Emission Frequency, MHz	Detected Amplitude, dBm	Setup Insertion Loss, dB	Spurious Emission Amplitude, dBm	Part 24 Limit, dBm
Channel 50 (1932.5 MHz)	1754.2	-39.2	22	-17.2	-13.0
	1922.7	-52.8	22	-30.8	-13.0
Channel 250 (1942.5 MHz)	1744.2	-38	22	-16	-13.0
	1932.7	-52.2	22	-30.2	-13.0
Channel 350 (1947.5 MHz)	1759.2	-40.5	22	-18	-13.0
	1937.7	-52.8	22	-30.8	-13.0

Note: all measurements were performed at a transmitter fundamental output power of 38.75 dBm (7.5 watts) average (three carriers).

4.4 FREQUENCY STABILITY

4.4.1 Test Procedure

Tests were performed in accordance with CFR 24.235. A CDMA PCS three carrier signal was injected into the HIC. The carrier under test was set to a pilot signal such that the CDMA analyzer was able to correlate the data. To obtain the necessary measurement precision, both the CDMA generator and the CDMA analyzer were locked to a common frequency reference.

Temperature tests were performed over the range of –40 to +60 °C (system operating range).

4.4.2 Instrumentation Used

Description	Model/Mfr.
CDMA Analyzer	8935C/HP
CDMA Generator	E4432B/HP
Temperature Chamber	PT-T14-2-2 / Sexton/ESPEC
Coupler	3202B-20/ Narda
Load	TRM-2143-M0-SMA-07 Midwest Microwave

4.4.3 Results - Temperature Variation

CMI Transmit Channel (Frequency)	Temp, ºC	Frequency Deviation
Channel 25 (1931.25 MHz)	-40	<100 Hz
Channel 50 (1932.5 MHz)	-40	<100 Hz
Channel 75 (1933.75 MHz)	-40	<100 Hz
Channel 175 (1936.25 MHz)	-40	<100 Hz
Channel 200 (1937.5 MHz)	-40	<100 Hz
Channel 225 (1938.75 MHz)	-40	<100 Hz
Channel 325 (1946.25 MHz)	-40	<100 Hz
Channel 350 (1947.5 MHz)	-40	<100 Hz
Channel 375 (1948.75 MHz)	-40	<100 Hz

CMI Transmit Channel (Frequency)	Temp, ºC	Frequency Deviation
Channel 25 (1931.25 MHz)	+60	<100 Hz
Channel 50 (1932.5 MHz)	+60	<100 Hz
Channel 75 (1933.75 MHz)	+60	<100 Hz
Channel 175 (1936.25 MHz)	+60	<100 Hz
Channel 200 (1937.5 MHz)	+60	<100 Hz
Channel 225 (1938.75 MHz)	+60	<100 Hz
Channel 325 (1946.25 MHz)	+60	<100 Hz
Channel 350 (1947.5 MHz)	+60	<100 Hz
Channel 375 (1948.75 MHz)	+60	<100 Hz