

5.1 TEST DATA

Equivalent Isotropic Radiated Power (E.I.R.P.) Radiated Measurements @ 3-meters:

Supply Voltage: 27.0 vdc
Modulation: PCS CDMA
Antenna: ETS 1 to 18 GHz S/N: 6751

FREQ. (MHz)	Level (dBm)	AFCL (dB)	POL (H/V)	Height (m)	Azimuth (0 angle)	F/S ($\mu\text{V/m}$)	Margin (dBm)	EIRP (W)
1931.25	6.94	27.5	H	1.7	48	11.8 E ⁶	46.21	41.8
1960.00	6.8	27.6	H	1.65	51	11.75 E ⁶	46.17	41.42
1988.75	6.65	27.7	H	1.55	47	11.68 E ⁶	46.12	40.93

Notes:

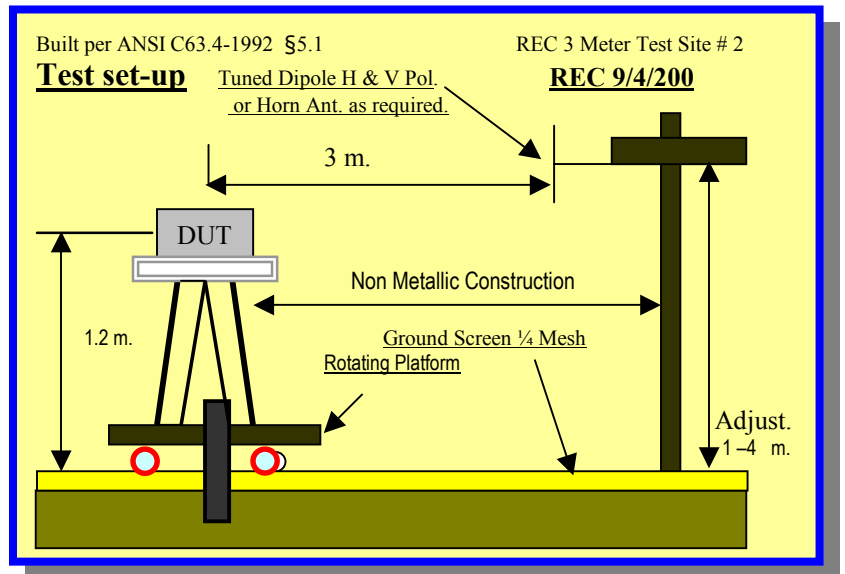
1. The bandwidth is set per §24.238 (RBW = 3 MHz, VBW = 3 MHz).
2. The spectrum was checked from 25 MHz up to the 10th harmonic
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -135 dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and the worse-case are reported.
6. The EUT is placed 3 m. away from the receiving antenna and the EIRP

is calculated using the formula:

$$\text{EIRP (dBm)} = 10 \log_{10} (((r(\mu\text{V/m})/1 \times 10^6)^2 / 30.0 / 1 \times 10^{-3})$$

$$\text{EIRP (dBm)} = 10 \log_{10} [(3 \times \text{FS} / 1 \times 10^6)^2 / (30.0) \times 1000]$$

$$\text{EIRP (Watts)} = \{ (3 \times \text{FS}) / 1 \times 10^6 \}^2 / 30.0$$



6.1 TEST DATA

Radiated Measurements

6.2 Field Strength of SPURIOUS Radiation for Base Station

Operating Frequency 1931.25 MHz (Base)
Channel 0025 LOW

Measured Maximum Output Power 24.5 Watts (43.89 dBm)
40.18 Watts (EIRP)

Modulation CDMA (internal)

Distance 3-meters

Limit $43 + \text{Log}_{10}(\text{W}) = 56.89 \text{ dBc}$

Antenna ETS Horn 1 to 18 GHz s/n 6751

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S ($\mu\text{V}/\text{m}$)	EIRP (dBm)	(dBc)	EIRP W P_{sig}
3862.5	- 88.5	32.5	H	354.81	-44.23	-90.27	3.78 E^{-8}
5793.75	-113.5	34.8	H	26.00	-66.93	-112.9	2.03 E^{-10}
7725.00	-118.6	37.6	H	19.95	-69.22	-115.3	1.19 E^{-10}
9656.25	-121.5	38.1	H	15.14	-71.63	-117.7	6.87 E^{-11}
11587.50	-116.5	39.0	H	29.85	-65.73	-111.8	2.67 E^{-10}
	< -135						

NOTES:

- The bandwidth is set per §24.238.
- The spectrum was checked from 25 MHz up to the 10th harmonic.
- All emissions not listed were found to be more than 20 dB below the limit.
- < -135 dBm is below the floor of the spectrum analyzer.
- The EUT is manipulated through 3 orthogonal axis and worst-cases are reported.
- The EUT is placed 3m. away from the receiving antenna and the EIRP is calculated using the formula:

$$\text{EIRP (dBm)} = 10\text{Log}_{10}(((r(\text{mV}/\text{m})1 \times 10^6)^2/30.0/1 \times 10^{-3})$$

$$\text{EIRP (dBm)} = 10\text{Log}_{10}[(3 \times \text{FS}/1 \times 10^6)^2/(30.0) \times 1000]$$

$$\text{EIRP (Watts)} = [3 \times \text{FS})/1 \times 10^6]^2/30.0$$
- $$\text{dBc} = 10\text{Log}_{10} \frac{P_{\text{sig}}}{P_{\text{tx}}}$$

6.1 Test Data (Continued)

Radiated Measurements

6.3 Field Strength of SPURIOUS Radiation Base Station

Operating Frequency 1960.00 MHz (Base)
Channel 0600 (middle)
Maximum Measured Output Power 25.0 Watts = 41.00 Watts EIRP (46.13 dBm)
Modulation Signal: CDMA (Internal)
Distance: 3 Meters
Limit: $43 + 10 \log_{10}(W) = -56.98 \text{ dBc}$
Antenna ETS 1 to 18 GHz s/n 6751

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S ($\mu\text{V/m}$)	EIRP (dBm)	(dBc)	EIRP W P_{SIG}
3920.00	-86.5	32.6	H	451.86	-42.13	-88.3	6.13 E^{-8}
5880.00	-115.2	34.8	H	26.60	-66.74	-112.86	2.12 E^{-10}
7840.00	-118.6	37.4	H	19.50	-69.43	-115.55	1.14 E^{-10}
9800.00	-120.0	38.1	H	17.99	-70.13	-116.26	9.71 E^{-11}
11760.00	-135	39.5	H	3.72	-83.03	-129.96	4.14 E^{-12}
	<-135						

NOTES:

- The bandwidth is set per §24.238.
- The spectrum was checked from 25 MHz up to the 10th harmonic.
- All emissions not listed were found to be more than 20 dB below the limit.
- < -135 dBm is below the floor of the spectrum analyzer.
- The EUT is manipulated through 3 orthogonal axis and worst-cases are reported.
- The EUT is placed 3m. away from the receiving antenna and the EIRP is calculated using the formula:

$$\begin{aligned} \text{EIRP (dBm)} &= 10\log_{10}(((r(\text{mV/m})1 \times 10^6)^2/30.0/1 \times 10^{-3}) \\ \text{EIRP (dBm)} &= 10\log_{10}[(3 \times \text{FS}/1 \times 10^6)^2/(30.0) \times 1000] \\ \text{EIRP (Watts)} &= [3 \times \text{FS})/1 \times 10^6]^2/30.0 \end{aligned}$$

$$7. \quad \text{dBc} = 10\log_{10} \frac{P_{\text{sig}}}{P_{\text{tx}}}$$

6.4 Field Strength of SPURIOUS Radiation

Operating Frequency: 1988.75 MHz (Base)
Channel: 1175 (High)
Measured Output Power: 23.8 Watts = 39.032 Watts EIRP (45.91 dBm)
Modulation Signal: CDMA (Internal)
Distance: 3 Meters
Limit: $43 + 10 \log_{10} (W) = -56.76 \text{ dBc}$
Antenna: ETS 1-18 GHz s/n 6751

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6.4 Field Strength of SPURIOUS Radiation (continued)

Freq. (MHz)	Level dBm	AFCL (dB)	POL (H / V)	F / S ($\mu\text{V/m}$)	EIRP (dBm)	(dBc)	EIRP W P _o (sig)
3977.50	- 98.2	32.7	H	118.58	-53.73	- 99.64	4.24 E ⁻⁹
5966.25	-116.7	34.8	H	17.99	-70.13	-116.04	9.71 E ⁻¹¹
7955.00	-118.2	37.4	H	15.14	-71.63	-117.54	6.87 E ⁻¹¹
9943.75	-126.5	38.5	H	8.91	-76.23	-122.14	2.38 E ⁻¹¹
11932.50	-122.5	39.4	H	15.67	-71.33	-117.24	7.36 E ⁻¹¹
13921.25	-121.8	42.5	H	34.27	-67.53	-113.43	1.77 E ⁻¹⁰
	<-135						

NOTES:

1. The bandwidth is set per §24.238.
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20 dB below the limit.
4. < -135 dBm is below the floor of the spectrum analyzer.
5. The EUT is manipulated through 3 orthogonal axis and worst-cases are reported.
6. The EUT is placed 3m. away from the receiving antenna and the EIRP is calculated using the formula:

$$\text{EIRP (dBm)} = 10\log_{10}((r(\text{mV/m})1 \times 10^6)^2/30.0/1 \times 10^{-3})$$

$$\text{EIRP (dBm)} = 10\log_{10}[(3 \times \text{FS}/1 \times 10^6)^2/(30.0) \times 1000]$$

$$\text{EIRP (Watts)} = [3 \times \text{FS}/1 \times 10^6]^2/30.0$$

7. $\text{dBc} = 10\log_{10} \frac{P_{\text{sig}}}{P_{\text{tx}}}$

**See 5.1 Test Data
for REC Test Site**

7.1 TEST DATA

7.2 Frequency Stability:

Test Date: 9/02/02
Operating Frequency: 10,000,000.0 Hz (osc.)
Channel: Master Oscillator placed in oven
Reference Voltage: 3.7 vdc
Deviation Limit: $\pm 0.00025\%$ or 2.5 ppm
Measured with TEK Counter: Model DC-508

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7.1 TEST DATA - Continued

7.2 Frequency Stability, continued

Voltage (%)	Pwr (vdc)	Temp (*C)	Frequency (Hz)	Deviation (%)	Dev. (ppm)
100%	3.7	+25° Ref.	10,000,000.0	0.000000	-0-
100%		-30	9,999,995.0	-0.000005	-.5
100%		-20	9,999,996.0	-0.000004	-.4
100%		-10	9,999,997.0	-0.000003	-.3
100%		-0-	10,000,003.0	+0.000007	+.3
100%		+10	10,000,003.0	+0.000003	+.3
100%		+20	10,000,002.0	+0.000002	+.2
100%		+25	10,000,000.0	+0.000000	-0-

100%		+30	10,000,00 2.0	+0.00002	+.2
100%		+40	10,000,00 3.0	+0.00003	+.3
100%		+50	10,000,00 4.0	+0.00004	+.4
100%	4.8	+60	10,000,00 6.0	+0.00006	+.6
=====	=====	=====	=====	=====	=====
85%	3.15	+25	10,000,00 0.0	0.000000	0.0
115%	4.26	+25	10,000,00 0.0	0.000000	0.0
Batt. End Voltage	2.8	25	10,000,00 0.0	0.000000	0.0

Note:

See Graph Exhibit # TT attached!

8.1 Plots of Emissions

Contained in this New attachment are Emission Plots of the Spectrum Analyzer (Agilent E4407B) taken during Spectrum Measurements for Spurious Emissions, Harmonics, Band Edges and Occupied Bandwidth. (Previously Filed with FCC) Three (3) Meter Test site Measurements are included in this report.

Norwood J. Patterson

Norwood J. Patterson

December 29, 2002

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9.1 Test Equipment Use with this project.

Exhibit 9.1 Pages 12 – 14
COM DEV/REC
9/12/02

9.2 EQUIPMENT USED FCC §2.947(d)**COM DEV “Access Point Base Station” (AP)**

<u>No.</u>	<u>Description</u>	<u>Make & Model</u>	<u>Cal. Date</u>	<u>Serial No.</u>
1.	Spectrum Analyzers	TEK 492/01/02/03 Fc 50 kHz to 60 GHz Agilent (HP) E4407B options (100 Hz to 26.5 GHz) (Track generator & Pre-amplifier dc to 3 GHz)	9/2003 9/2003	 US4024323
2.	Frequency Standard	Sections 8131 RX Locked to NBS, WWVB of Ft. Collins, Co.	10/2003	
3.	RF Attenuators	HP 8495B 11 dB HP 8494B 1 db HP 8498A dc to 18 GHz HP 11581A Set Weinschell 48-30-43 dc to 18 GHz Weinschell SMA Set .1 to 20 dB 3300		117161 11716 0072 20312, 019806, 34123 & 31245 AN7909 E6671
4.	Calibrated Antennas	Ailtech Horn 94627-1 Ailtech Horn 94626-1 Stoddard Discone AT570 GHz ground plane Dipole AH (1 to 1.0 GHz) ETS Horn (1 to 18 GHz) ETS Horn (1 to 18 GHz)	12/2003 12/2003 10/2003 12/2003 12/2003 12/2003	0122 0122 REC 1.9 REC-1.9 128-134 6721 6751
5.	RF Radiation	NARDA Test Set 8718 with Probes 300 kHz to 40 GHz “Power Density Meter”	10/2003	

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9.2 Equipment Used, continued

6.	Frequency Counters	Agilent E53150A	10/2003
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		(10 Hz to 20 GHz) Lock with 10 MHz to WWVB Ft. Collins, Co. TEK 508 HP 5342 10 Hz to 18 GHz	12/2003 11/2003	
7.	Power	HP 435B (100 kHz to 26.5 GHz) HP 3150A (Resolution 01 kHz to 20 GHz) Agilent 53150A 50 (100 MHz to 20 GHz) (Res. 1 Hz at 1.0 GHz) HP434 Calorimetric Power Meter dc to 12.4 GHz	10/2003 8/2003 11/2003	7679 US01324 02890
8.	Power Sensors	For HP 435B HP 8481a (.01 to 18 GHz) HP 8484a (.01 to 18 GHz)	12/23003 12/2003 12/2003	7679 0699 6537
9.	RF Signal Generator	HP 8640B HP 8656A Spectrum 8131 HP 618 (TS621) HP 616a (TS403) TEK TR503 Agilent E 82510 A (250 kHz to 20 GHz) Output Level 0 to 20 dBm.) Tracking Generator with the Agilent S/A E4407B	10/2003 12/2003 11/2003 8/2003 8/2003 9/1003 5/2003 5/2003	A01904 A00479 CAQI B010267 US40131
10.	Frequency Dubler	HP 11721A		0395
11.	Power Supplies	HP 6269B (4 ea.)		
12.	Digital Volt Meters	TEK TM503 B119131 TEK DM501A BO245746		
13.	Directional Couplers	BIRD 4275-020 BIRD 4274-025		
14.	RF Loads	SMA 50 Ω Weinschell TEK 50 Ω 011-0123-00 GR 874-W50B GR 50 Ω 874		

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9.1 **Equipment Used, continued**

15.	RF Cables	Various Lengths RG 55 13' Andrew FSJ1		
16.	Receiver	WWVB Spectrum 8163 (Part of Frequency Standard)	10/2003	
17.	RF Mixers	TEK PN016-0631-03 (18 to 26.5 GHz)		
18.	RF Power Density	Narda Model 8718	8/2003	s/n 01226
		Narda Probe model 8722B	8/2003	s/n 14002
		Narda Probe model 98723	8/2003	s/n 05012

Procedures Used US & Canada:

IS-856	IS-2000 Rev. A (CDMA 2000 Series)
IS-138-A	OST-55
OST-65	SS133
TRC-49	SP-510
IS-95	EIA 603-A-2-2001

Standards are replaced, as new “updated” Standards become available

10.1 Sample Calculations

A. EIRP Calculation

$$\begin{aligned}\text{Signal level } \mu\text{V/m @ 3 meters} &= \text{Log}_{10}^{-1} \left(\frac{-15+107+\text{AFCL}}{20} \right) \\ &= \text{Log}_{10}^{-1} \left(\frac{-15+107+32.5}{20} \right) \\ &= 1,678,804.0 \mu\text{V/m @ 3 meters}\end{aligned}$$

A.1 Sample Calculation (relative to a 1/2 λ dipole)

$$\text{EIRP (dBm)} = 10 \text{ Log}_{10} \left(\left(\frac{r(\mu\text{V/m})}{1 \times 10^6} \right)^2 / 30 \cdot E^3 \right)$$

$$\text{EIRP (dBm)} = 10 \text{ Log}_{10} \left(\left(\frac{3(1,678,804.4)}{1 \times 10^6} \right)^2 / 30 \cdot 0.0E^3 \right)$$

$$\text{EIRP (dBm)} = -30.729 = .845 \text{ Watts}$$

Note: AFCL = Antenna factor adjusted for cable loss.

B. Emission Designator

CDMA Sample

2M + 2DK

CDMA BW = 1.25 MHz

F = Frequency Modulation

G = Composite digital information

W = Combination (Audio/Data)

Emission Designator = 1M25F9W (See test oscillogram Exhibit D attached)

C. Decibels Below Carrier (dBc)

$$\text{dBc} = 10 \log_{10} (P_{\text{sig}} / P_{\text{Tx}})$$

$$\text{dBc} = 10 \log_{10} (2.3\text{E}^{-7} / .960) = -66.21$$

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11.0 Conclusion

The data contained in this report shows that the AP data transmitter
FCC ID: JJA-90010000xx is capable of complying with the FCC Rules, Regulations
and Policies with specific application of Parts 2 and 24. No changes were made to
the device to make it comply. It was tested just as Com Dev delivered the unit to
REC Lab.

Norwood J. Patterson,
12/29/2002

Engineering Consultant

