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 (µV/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

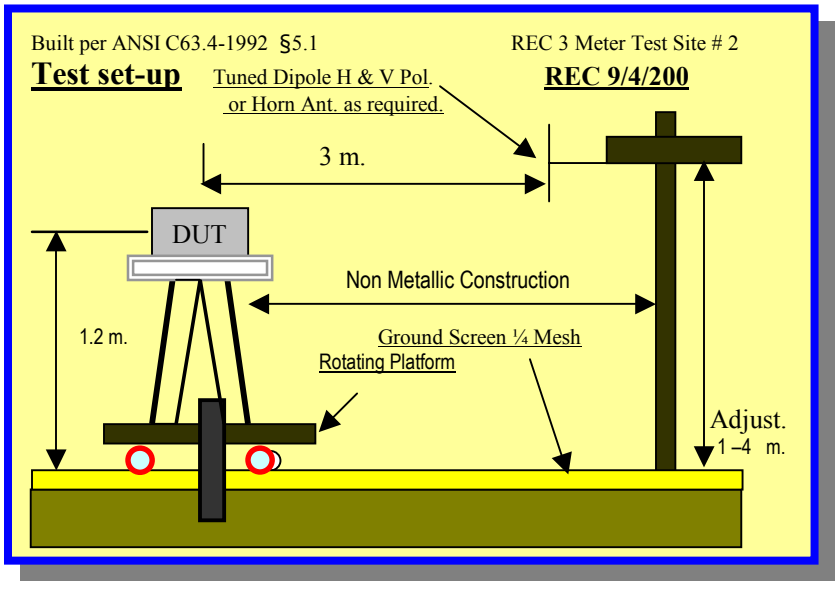
Notes:

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:

EIRP (dBm) = $10 \text{ Log}_{10} (((r(\mu V/m)/1 \times 10^6)^2 /30.0/1x10?\ ^3)$

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

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



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 + Log_{10} (W) = 56.89 dBc
Antenna ETS Horn 1 to 18 GHz	s/n 6751

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (µV/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:

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:

   EIRP (dBm) = $10Log_{10}(((r(mV/m)1 \times 10^6)^2/30.0/1x10^{-3}$

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

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

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

See 5-1 Test Data
for REC Test Site

Test Report – Com Dev
FCC Part 24 Certification
Test Date: 9/3/02

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 dBc
Antenna ETS 1 to 18 GHz	s/n 6751

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (µV/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:

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:

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

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

See 5.1 Test Data
for REC Test Site

Radiated Measurements

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 dBc
Antenna: ETS 1-18 GHz	s/n 6751

Test Report – Com Dev
FCC Part 24 Certification
Test Date: 9/3/02

6.4 Field Strength of SPURIOUS Radiation (continued)

Freq. (MHz)	Level dBm	AFCL (dB)	POL (H / V)	F / S (µV/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:

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

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

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

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

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 Oscillor placed in oven
Reference Voltage:	3.7 vdc
Deviation Limit:	±0.00025% or 2.5 ppm
Measured with TEK Counter:	Model DC-508

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	-o-
100%		-30	9,999,995.0	-0.00005	-.5
100%		-20	9,999,996.0	-0.00004	-.4
100%		-10	9,999,997.0	-0.00003	-.3
100%		-o-	10,000,003.0	+0.00007	+.3
100%		+10	10,000,003.0	+0.00003	+.3
100%		+20	10,000,002.0	+0.00002	+.2
100%		+25	10,000,000.0	+0.00000	-0-

100%		+30	10,000,002.0	+0.00002	+.2
100%		+40	10,000,003.0	+0.00003	+.3
100%		+50	10,000,004.0	+0.00004	+.4
100%	4.8	+60	10,000,006.0	+0.00006	+.6
======	=====	=======	==========	=========	=======
85%	3.15	+25	10,000,000.0	0.000000	0.0
115%	4.26	+25	10,000,000.0	0.000000	0.0
Batt. End Voltage	2.8	25	10,000,000.0	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 (Angilent 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

9.1 Test Equipment Use with this project.

9.2 EQUIPMENT USED FCC §2.947(d)

COM DEV "Access Point Base Station" (AP)

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

9.2 Equipment Used, continued

6.	Frequency Counters	Agilent E53150A	10/2003	

		(10 Hz to 20 GHz) **Lock with 10 MHz to** **WWVB Ft. Collins, Co.**		
		TEK 508	**12/2003**	
		HP 5342 10 Hz to 18 GHz	**11/2003**	
7.	**Power**	**HP 435B (100 kHz to 26.5 GHz)**	**10/2003**	**7679**
		HP 3150A (Resolution 01 kHz to 20 GHz)		
		Agilent 53150A 50 (100 MHz to 20 GHz)	**8/2003**	**US01324**
		(Res. 1 Hz at 1.0 GHz)		
		HP434 Calorimetric Power Meter dc to 12.4 GHz	**11/2003**	**02890**
8.	**Power Sensors**	**For HP 435B**	**12/23003**	**7679**
		HP 8481a (.01 to 18 GHz)	**12/2003**	**0699**
		HP 8484a (.01 to 18 GHz)	**12/2003**	**6537**
9.	**RF Signal Generator**	**HP 8640B**	**10/2003**	**A01904**
		HP 8656A	**12/2003**	**A00479**
		Spectrum 8131	**11/2003**	
		HP 618 (TS621)	**8/2003**	**CAQI**
		HP 616a (TS403)	**8/2003**	
		TEK TR503	**9/1003**	**B010267**
		Agilent E 82510 A (250 kHz to 20 GHz) Output Level 0 to 20 dBm.)	**5/2003**	**US40131**
		Tracking Generator with the Agilent S/A E4407B	**5/2003**	
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 50Ω 011-0123-00		
		GR 874-W50B		
		GR 50Ω 874		

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

Signal level µV/m @ 3 meters = $\text{Log}_{10}^{-1}\frac{(-15+107+AFCL)}{20}$

$$= \text{Log}_{10}^{-1}\frac{(-15+107+32.5)}{20}$$

$$= 1{,}678{,}804.0\ \mu V/m\ @\ 3\ \text{meters}$$

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

$$\text{EIRP (dBm)} = 10\ \text{Log}_{10}(((r(\mu V/m)/1x10^6)^2/30.E^3)$$

$$\text{EIRP (dBm)} = 10\ \text{Log}_{10}(((3(1{,}678{,}804.4)/1E10^6)^2/30.0E^3)$$

EIRP (dBm) = −30.729 = .845 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)

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

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

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