

FCC PART 22, 24 TYPE APPROVAL EMI MEASUREMENT AND TEST REPORT

For

CyberNet Inc.

6th Floor, Sebang Bldg.(New Bldg.) 708-8, Yoksamdong Kangnamku, Seoul, Korea

FCC ID: RXT-JADE-AI-CNN01

2004-04-08

This Report Concerns: ☒ Original Report	Equipment Type: Wireless POS Terminal
Test Engineer: Ling Zhang / 	
Report No.: R0402192	
Test Date: 2004-03-24	
Reviewed By: Ming Jing / 	
Prepared By: Bay Area Compliance Laboratory Corporation (BACL) 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164	

Note: This test report is specially limited to the above client company and the product model only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *CyberNet Inc* product, FCC ID:RXT-JADE-A1-CNN01 or the "EUT" as referred to in this report is a Wireless POS Terminal, which is measured approximately 218mmL x 78mmW x 66mmH.

** The test data gathered are from typical production sample, serial number: DM04010002, provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of *CyberNet Inc* in accordance with Part 2, Subpart J, Part 15, Subparts A and B, Part 22 Subpart H, and Part 24 Subpart E of the Federal Communication Commissions rules.

It is also prepared in accordance with Part 2, Subpart J, Part 15, Subparts A and B, Part 22 Subpart H and Part 24 Subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for output power, modulation characteristic, occupied bandwidth, spurious emission at antenna terminal, field strength of spurious radiation, frequency stability, and conducted and radiated margin.

Related Submittal(s)/Grant(s)

No Related Submittals

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 15 Subpart B – Unintentional Radiators
Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E - PCS

Applicable Standards: TIA EIA 137-A, TIA EIA 98-C, ANSI 63.4-1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Open Area Test site used by BACL Corp. to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules and Article 8 of the VCCI regulations. The facility also complies with the test methods and procedures set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22: 1997, Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods.

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to ANSI C63.4-2001.

The final qualification test was performed with the EUT operating at normal mode.

Block Diagram

Please refer to Exhibit D.

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
SONY	Notebook PC	PCG-F150	28986303404240	DOC
HP	Printer	2225C	N/A	DOC

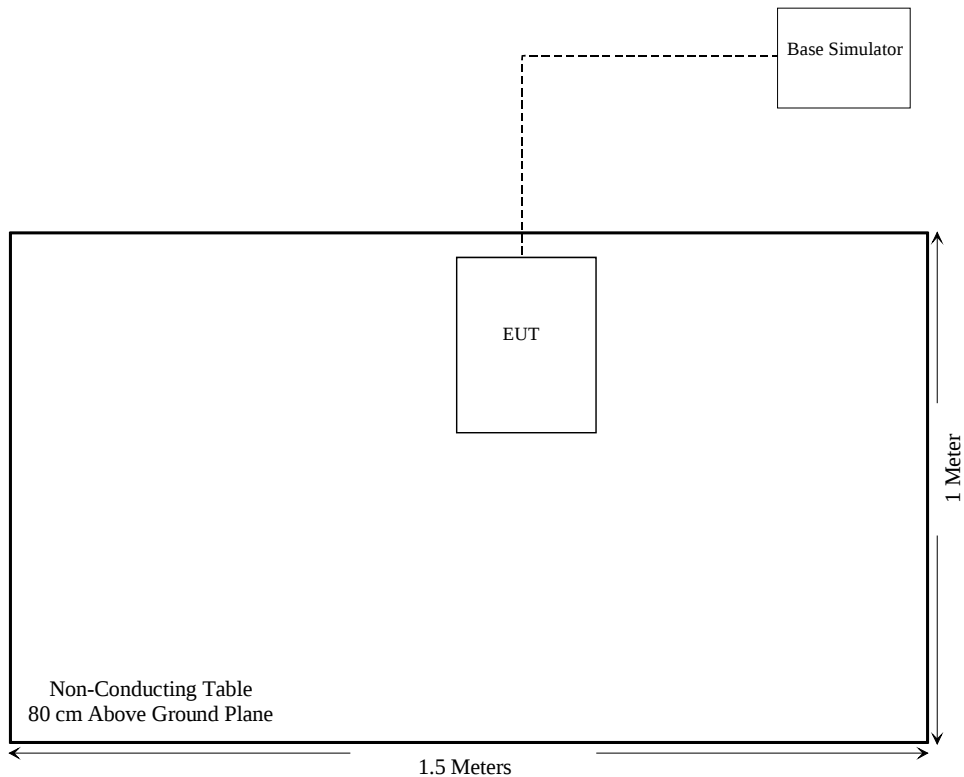
External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Shielded Printer Cable	1.5	Parallel Port/Notebook PC	Printer
Shielded data cable	1	Serial port/Notebook PC	EUT

Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
CyberNet Inc.	AC/DC Adapter	SP2701A	SB0312000200	N/A

Test Setup Block Diagram



SUMMARY OF TEST RESULTS

FCC RULE	DESCRIPTION OF TEST	RESULT
§ 2.1047	Modulation Characteristics	Compliant
§ 2.1053	Field Strength of Spurious Radiation	Compliant
§2.1093	RF Exposure	Compliant
§ 15.107	Conducted Emissions	Compliant
§ 2.1046, § 22.912 (d) § 24.232	RF Output Power	Compliant
§ 2.1046, § 22.913 (a) § 24.232	Conducted Output Power	N/A
§ 2.1049 § 22.917 § 22.905 § 24.238	Out of Band Emission, Occupied Bandwidth	Compliant
§ 2.1051, § 22.917 § 24.238(a)	Spurious Emissions at Antenna Terminals	Compliant
§ 2.1055 (a) § 2.1055 (d) § 22.355 § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant
§ 22.917 §24.238	Band Edge	Compliant

§2.1047 - MODULATION CHARACTERISTIC

Applicable Standard

Requirement: FCC § 2.1047.

Test Procedure

CDMA digital mode is used by EUT.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2003-08-01
HP	Plotter	HP7470A	2541A49659	Not Required

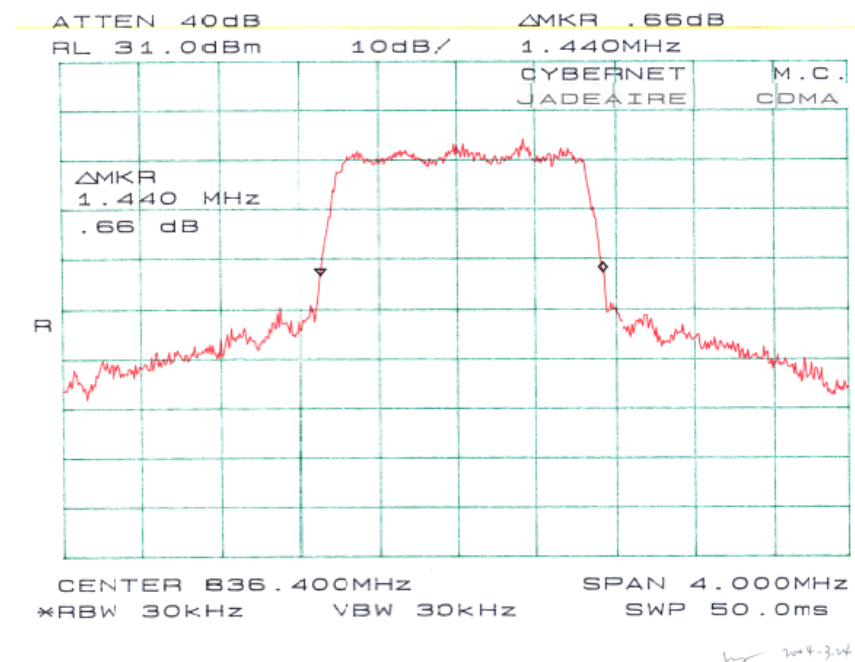
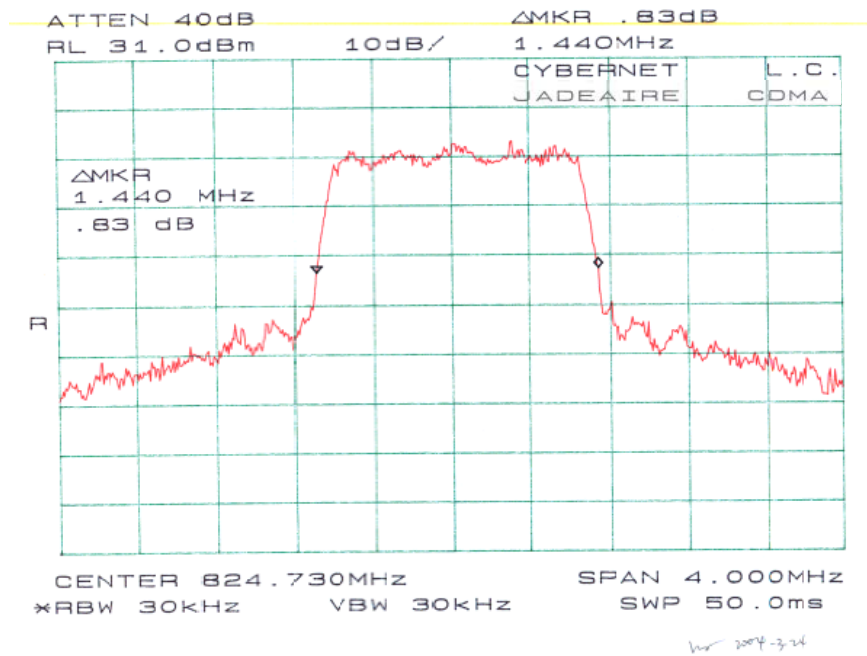
* **Statement of Traceability:** **BACL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

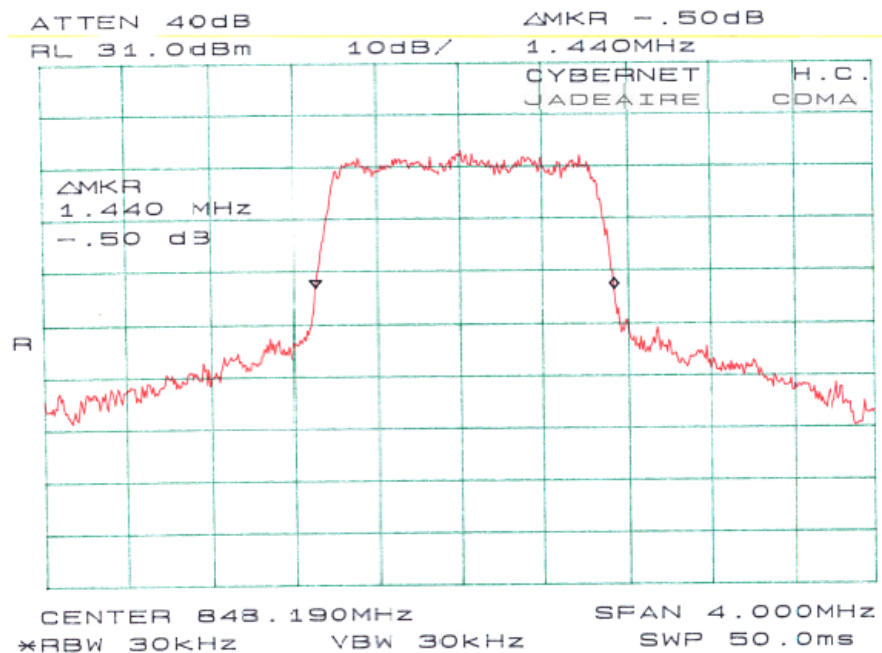
Environmental Conditions

Temperature:	19°C
Relative Humidity:	60%
ATM Pressure:	1020 mbar

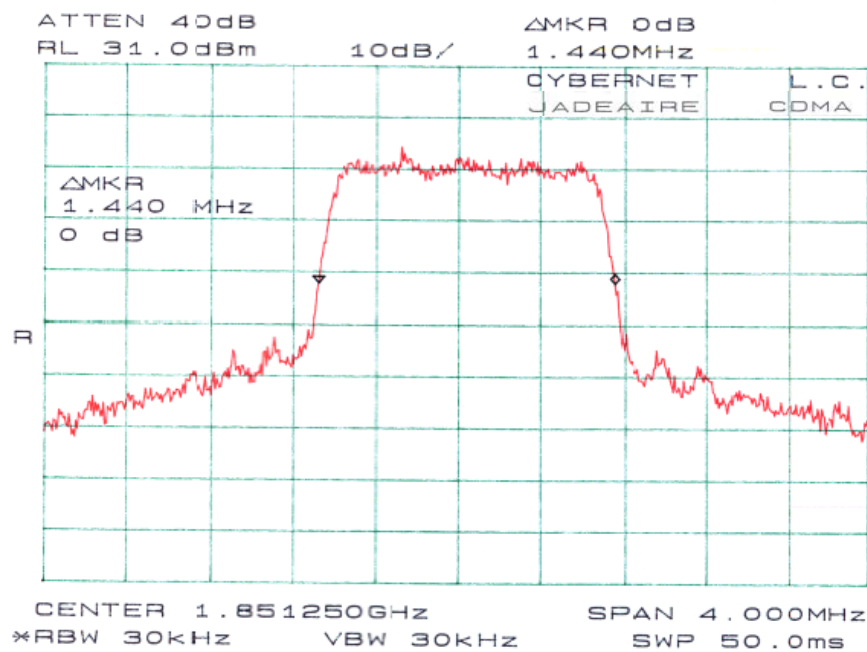
Test Results

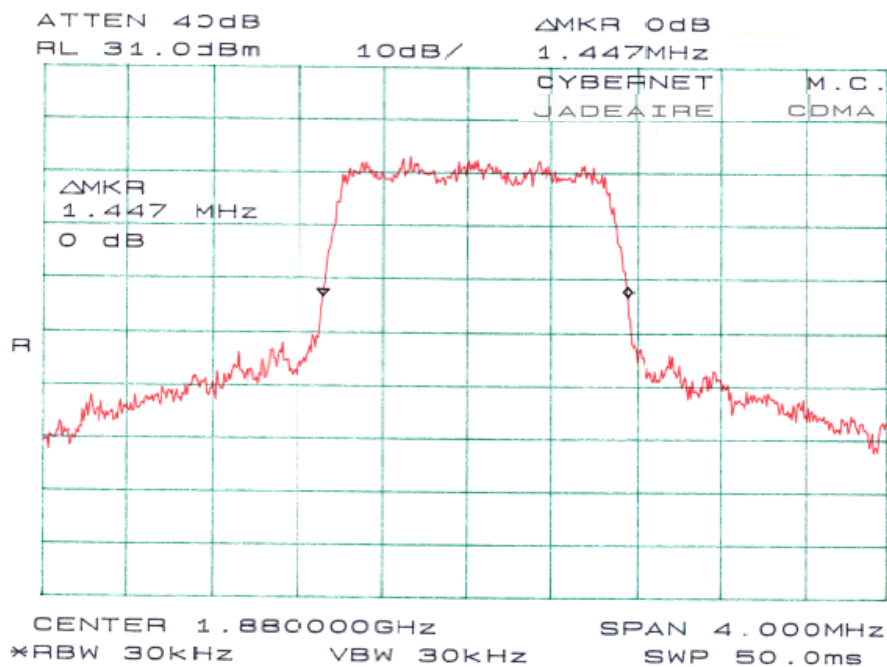
Please refer to the hereinafter plots.

Plots of Modulation Characteristic for Part22

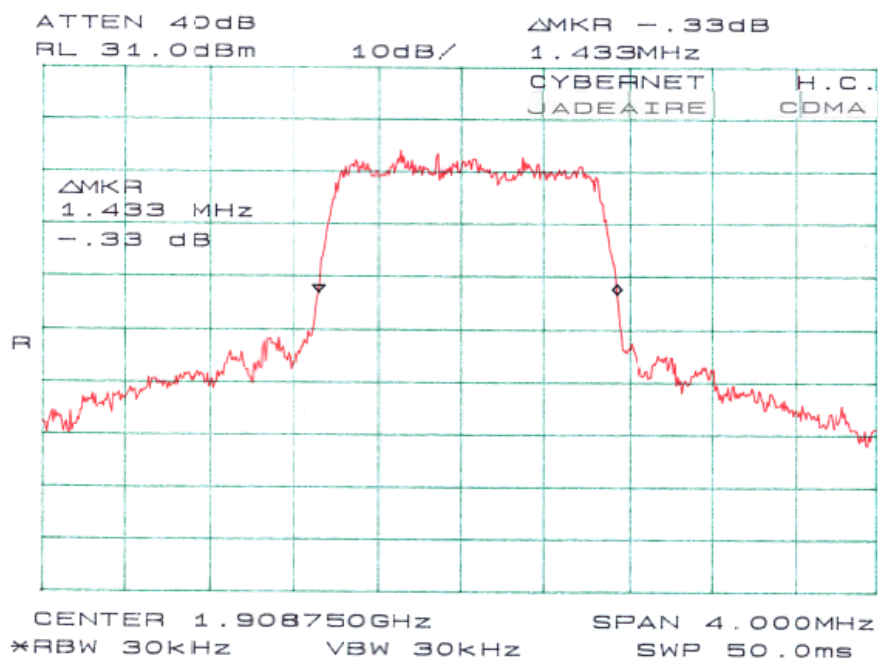


Plots of Modulation Characteristic for Part24





2024-3-24



2004-3-24

§2.1053 - SPURIOUS RADIATED EMISSIONS

Applicable Standard

Requirements: CFR 47, § 2.1053.

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = $10 \lg (\text{TXpwr in Watts}/0.001)$ – the absolute level

Spurious attenuation limit in dB = $43 + 10 \text{ Log}_{10} (\text{power out in Watts})$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8568B	2601A02165	2003-07-03
HP	Amplifier	8447E	2944A10187	2003-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2003-06-13
EMCO	Biconical Antenna	3110B	9309-1165	2003-10-11
EMCO	Log Periodic Antenna	3146	2101	2003-10-11
AH System	Horn Antenna	SAS-200/511	261	2003-08-02

*** Statement of Traceability: BACL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	19° C
Relative Humidity:	60%
ATM Pressure:	1020 mbar

Test Result

FCC Part 22: CDMA 800

Low Frequency: -14.7 dB at 1649.46 MHz
Middle Frequency: -12.4 dB at 1672.80 MHz
High Frequency: -13.6 dB at 1696.38 MHz

FCC Part 24: CDMA 1900

Low Frequency: -18.1 dB at 5553.75 MHz
Middle Frequency: -22.0 dB at 5640 MHz
High Frequency: -21.4 dB at 5726.25 MHz

Test Data for CDMA800

EUT					Substitution		Generator			Standard	
Indicated		Table	Test Antenna				Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
Low Channel											
824.73	125.17	0	2.5	V	824.73	21.8	0	0.1	21.7		
824.73	125.67	60	1.6	H	824.73	22.6	0	0.1	22.5		
1649.46	42.67	220	1.5	H	1649.46	-34.0	6.8	0.5	-27.7	-13	-14.7
1649.46	42.33	100	1.6	V	1649.46	-34.2	6.8	0.5	-27.9	-13	-14.9
2474.19	38.33	200	1.5	H	2474.19	-40.3	7.6	0.7	-33.4	-13	-20.4
2474.19	37.5	0	1.6	V	2474.19	-41.5	7.6	0.7	-34.6	-13	-21.6
MIDDLE CHANNEL											
836.4	124.83	0	2.5	V	836.4	21.5	0	0.1	21.4		
836.4	126.17	60	1.8	H	836.4	23.3	0	0.1	23.2		
1672.8	45.17	250	1.4	H	1672.8	-31.7	6.8	0.5	-25.4	-13	-12.4
1672.8	43.33	0	1.4	V	1672.8	-33.3	6.8	0.5	-27	-13	-14.0
2509.2	38.33	60	1.6	V	2509.2	-40.2	7.6	0.7	-33.3	-13	-20.3
2509.2	38.17	180	1.6	H	2509.2	-40.3	7.6	0.7	-33.4	-13	-20.4
HIGH CHANNEL											
848.19	124.67	120	1.5	V	848.19	21.4	0	0.1	21.3		
848.19	125	0	2.1	H	848.19	22.2	0	0.1	22.1		
1696.38	43.83	100	1.4	V	1696.38	-32.9	6.8	0.5	-26.6	-13	-13.6
1696.38	43	150	1.2	H	1696.38	-33.5	6.8	0.5	-27.2	-13	-14.2
2544.57	38.5	0	1.6	V	2544.57	-40.1	7.6	0.7	-33.2	-13	-20.2
2544.57	37.83	30	1.8	H	2544.57	-41.3	7.6	0.7	-34.4	-13	-21.4

Test Data for CDMA1900

EUT							Generator			Standard	
Indicated		Table	Test Antenna		Substitution		Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
Low Channel											
1851.25	120.33	330	2	V	1851.25	16.5	8.3	3.4	21.4		
1851.25	121.67	0	2.5	H	1851.25	17.7	8.3	3.4	22.6		
5553.75	61.33	30	1.8	H	5553.75	-36.3	10.6	5.4	-31.1	-13	-18.1
5553.75	62.67	270	1.8	V	5553.75	-37.2	10.6	5.4	-32	-13	-19.0
3702.5	55	330	1.8	V	3702.5	-42.8	10.3	4.3	-36.8	-13	-23.8
3702.5	53.33	250	2	H	3702.5	-44.2	10.3	4.3	-38.2	-13	-25.2
MIDDLE CHANNEL											
1880	119.83	330	2.2	V	1880	16.1	8.3	3.4	21		
1880	120.67	150	2	H	1880	16.8	8.3	3.4	21.7		
5640	58	270	1.5	V	5640	-40.2	10.6	5.4	-35	-13	-22.0
5640	55.67	90	1.8	H	5640	-42.5	10.6	5.4	-37.3	-13	-24.3
3760	53	100	2	V	3760	-44.4	10.3	4.3	-38.4	-13	-25.4
3760	52.33	90	2	H	3760	-45.0	10.3	4.3	-39	-13	-26.0
HIGH CHANNEL											
1908.75	119	0	1.8	V	1908.75	15.4	8.3	3.4	20.3		
1908.75	120.17	150	2.5	H	1908.75	16.5	8.3	3.4	21.4		
5726.25	59.17	330	1.8	V	5726.25	-39.6	10.6	5.4	-34.4	-13	-21.4
5726.25	55.83	60	1.6	H	5726.25	-42.3	10.6	5.4	-37.1	-13	-24.1
3817.5	53.83	270	2.2	H	3817.5	-44.5	10.3	4.3	-38.5	-13	-25.5
3817.5	53.5	90	2	V	3817.5	-44.8	10.3	4.3	-38.8	-13	-25.8

§1.1307(b)(1) & §2.1093 - RF EXPOSURE

According to §15.247(b)(4) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

CDMA800

Maximum peak output power at antenna input terminal: 25.00 (dBm)

Maximum peak output power at antenna input terminal: 316.23 (mW)

Prediction distance: 2.5 (cm)

Predication frequency: 800 (MHz)

Antenna Gain (typical): 1.5 (dBi)

antenna gain: 1.41 (numeric)

Power density at predication frequency at 2.5 cm: 5.68 (mW/cm²)

MPE limit for uncontrolled exposure at prediction frequency: 0.53 (mW/cm²)

CDMA1900Maximum peak output power at antenna input terminal: 24.83 (dBm)Maximum peak output power at antenna input terminal: 304.09 (mW)Prediction distance: 2.5 (cm)Predication frequency: 1900 (MHz)Antenna Gain (typical): 1.5 (dBi)antenna gain: 1.41 (numeric)Power density at predication frequency at 2.5 cm: 5.46 (mW/cm²)MPE limit for uncontrolled exposure at prediction frequency: 1.0 (mW/cm²)**Test Result**

The EUT is a mobile device. The power density level at 2.5 cm is 5.68 mW/cm², which is below the uncontrolled exposure limit of 0.53mW/cm² at 800 MHz. The power density level at 2.5 cm is 5.46 mW/cm², which is below the uncontrolled exposure limit of 1.0mW/cm² at 1900 MHz.

§2.1046, §22.912(d), & §24.232 - RF POWER OUTPUT

Applicable Standard

According to FCC §2.1046 and §24.232 (1), mobile/portable stations are limited to 2 watts EIRP.
According to FCC §22.912(d), the ERP of mobile transmitters must not exceed 7 watts.

Test Procedure

1. On a test site, the EUT shall be placed at 1.5m height on a turn table, and in the position closest to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3m from EUT to correspond to the frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the quasi-peak detector is used for the measurement.
4. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The transmitter shall be replaced by a horn (substitution antenna).
10. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. In necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
15. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

17. The measure of the effective radiated power is the large of the two levels recorded, at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8568B	2601A02165	2003-07-03
HP	Amplifier	8447E	2944A10187	2003-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2003-06-13
EMCO	Biconical Antenna	3110B	9309-1165	2003-10-11
EMCO	Log Periodic Antenna	3146	2101	2003-10-11
AH System	Horn Antenna	SAS-200/511	261	2003-08-02

* **Statement of Traceability:** **BACL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	19° C
Relative Humidity:	60%
ATM Pressure:	1020 mbar

Test Results

For CDMA800:

FREQUENCY (MHZ)	SUBSTITUTION READING (dBm)	SUBSTITUTION ANTENNA GAIN	SUBSTITUTION CALBE LOSS (dB)	ERP (dBm)
824.73	22.6	0	0.1	22.5
836.40	23.3	0	0.1	23.2
848.19	22.2	0	0.1	22.1

For CDMA1900 :

FREQUENCY (MHZ)	SUBSTITUTION READING (dBm)	SUBSTITUTION ANTENNA GAIN	SUBSTITUTION CALBE LOSS (dB)	EIRP (dBm)
1851.25	17.7	8.3	3.4	22.6
1880.00	16.8	8.3	3.4	21.7
1908.75	16.5	8.3	3.4	21.4

Sample calculation:

Absolute level = substitution reading + antenna gain - cable loss

For example:

$$17.7 + 8.3 - 3.4 = 22.6$$