TIMCO ENGINEERING INC.
849 NW State Road 45
Newberry, Florida 32669
http://www.timcoengr.com
888.472.2424 F 352.472.2030 email: sid@timcoengr.com

FCC Test Report

Test Report

Product Name: TRI-MODE CDMA WIRELESS MODULE KIT

FCC ID: Q9EQ2438F-M

Applicant:

WAVECOM.SA
Rue du Gouverneur General Eboue
Issy-les-Moulineaux Cedex 92442
FRANCE

Date Receipt: MAY 5, 2005

Date Tested: MAY 18, 2005

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APPLICANT: WAVECOM.SA

FCC ID: Q9EQ2438F-M

TEST REPORT:

EXHIBITS INCLUDING:

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GENERAL INFORMATION

2.1033(c)(1)(2) WAVECOME SA will sell the FCC ID: Q9EQ2438F-M Fixed WLL cellular module for use under FCC RULES PART 22H and 24E.

2.1033(c) **TECHNICAL DESCRIPTION**

2.1033 (3) The User Manual is included in the exhibits.

2.1033 (4) Type of Emission: 1M25F9W (CDMA)

99 % Power bandwidth = 1.25 MHz
Bn = 1.250 MHz
F = Frequency modulation
9 = Composite system containing one or more channels of quantized or digital information, together with one or more channels containing analogue information.
W = Combination audio and data

2.1033 (4) Type of Emission: 40K0F8W

99 % Power bandwidth = 40 kHz
Bn = 40 kHz
F = Frequency modulation
8 = 2 or more channels containing analogue information
W = Combination of telephony or data or signaling

2.1033 (4) Type of Emission: 40K0F1D

99 % Power bandwidth = 40 kHz
Bn = 40 kHz
F = Frequency modulation
1 = 1 channel containing quantized or digital information
D = data or telecommand

2.1033 (5) Frequency Range: 824-849 MHz (CDMA 850, AMPS)
1850-1910 MHz (PCS CDMA)

(6) Power Range and Controls: There are NO user Power controls.

(7) Maximum Output Power Rating:
See next page

(8) DC Voltages and Current into Final Amplifier:
See next page

(9) Tune-up procedure. The module does not have any tuning points.

(10) Complete Circuit Diagrams: Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description in the instruction manual. The circuit diagram and block diagram are included in the exhibits.

2.1033(c)(11) A photograph or drawing of the equipment identification label is shown in the Exhibits.

2.1033(c)(12) Photographs of the equipment of sufficient clarity to reveal equipment construction and layout and label location, are shown in the Exhibits.

2.1033(c)(13) For equipment employing digital modulation, a detail description of the modulation technique.

2.1033(c)(14) Data required for 2.1046 to 2.1057 See Below

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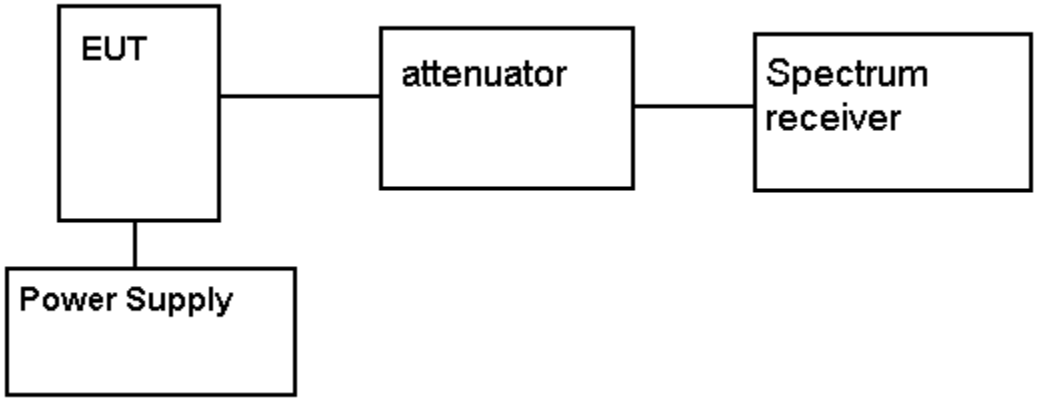
2.1046(a) **RF power output:**

RF power is measured by connecting a 50 ohm, resistive spectrum analyzer (Agilent 8572A) to the RF output connector. With a nominal voltage applied using a fully charged battery supply specified with this device, and the transmitter properly adjusted the RF output measures:

METHOD OF MEASURING RF POWER OUTPUT



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CDMA Module Input power (RF module)

INPUT POWER: (CDMA 850): (3.8Vdc)(1.1A) = 4.2 Watts
INPUT POWER: (PCS 1900): (3.8Vdc) (1.0A) = 3.8 Watts
INPUT POWER: (AMPS) (3.8 Vdc) ((1.0A) = 3.8 Watts
OUTPUT POWER: (CDMA 850) see below
OUTPUT POWER: (PCS CDMA 1900) see below
OUTPUT POWER: (AMPS) see below

Conducted output power was measured using a Spectrum Analyzer with a 50 Ohm input port:

AMPS

Low Channel	29.5 dBm
Mid Channel	29.4 dBm
High Channel	29.3 dBm

CDMA 850

Low Channel	26.0 dBm
Mid Channel	25.9 dBm
High Channel	25.8 dBm

PCS CDMA 1900

Low Channel	26.0 dBm
Mid Channel	25.9 dBm
High Channel	25.9 dBm

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2.1047(a) **Voice Modulation characteristics**:
NOT APPLICABLE, F9 or G9 type of emission.

2.1047 **Audio Low Pass Filter**
This UUT does not have a low pass filter.

2.1049 **Occupied bandwidth: 99% power bandwidth**:

22.917 (e) **Out of band emissions**: The mean power of emissions must be attenuated below the mean power of the un-modulated carrier (P) on any frequency twice or more than twice the fundamental frequency by:
At least 43 + 10log(Po) = dB.

Band-edges compliance: Measurement were performed in accordance with Part 22.917 (h)

Conducted output power: 26 dBm

CDMA 850

Channel (	Band-edge Frequency (MHz)	Amplitude level at the band-edge(dBm)	Limit (dBm)	Margin (dB)
1013	824.0	-14.8	-13.0	1.8
777	849.0	-16.1	-13.0	3.1

Conducted output power: 26 dBm

PCS 1900

Channel (MHz)	Band-edge Frequency (MHz)	Amplitude level at the band-edge(dBm)	Limit (dBm)	Margin (dB)
25	1850	-21.5	-13.0	8.5
1175	1910	-22.2	-13.0	9.2

The following plot shows the composite power measured with a RBW = 3MHz = VBW and the modulated envelope measured with a RBW = 30 kHz = VBW

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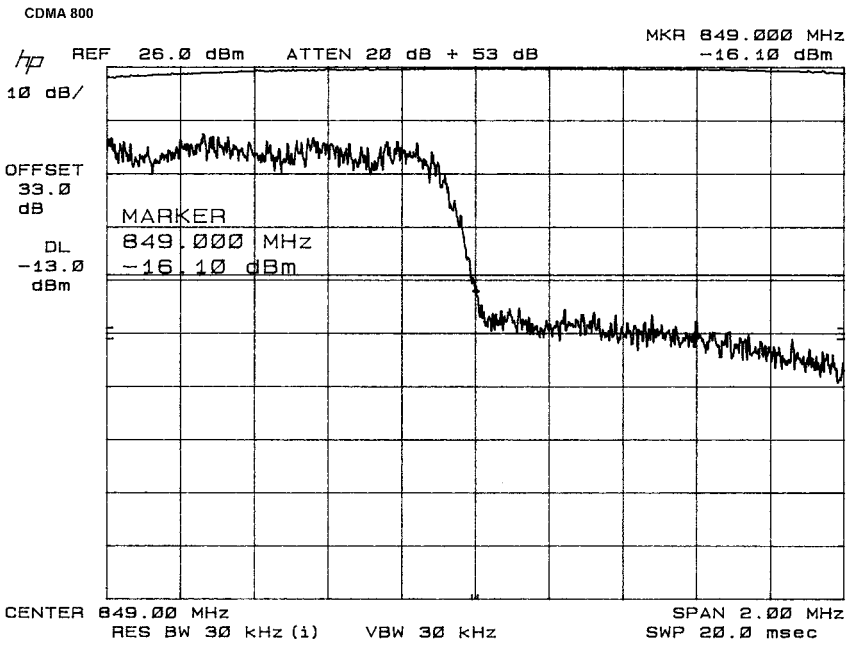

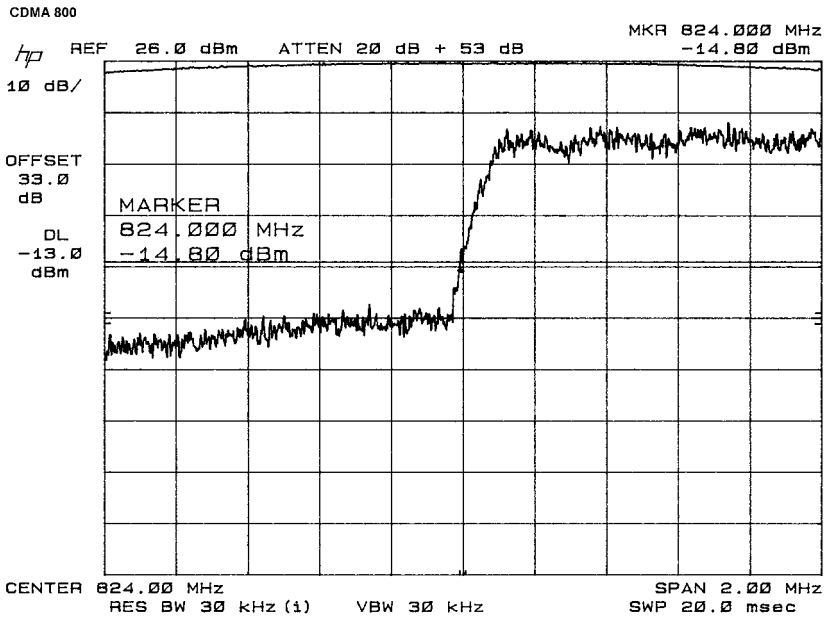

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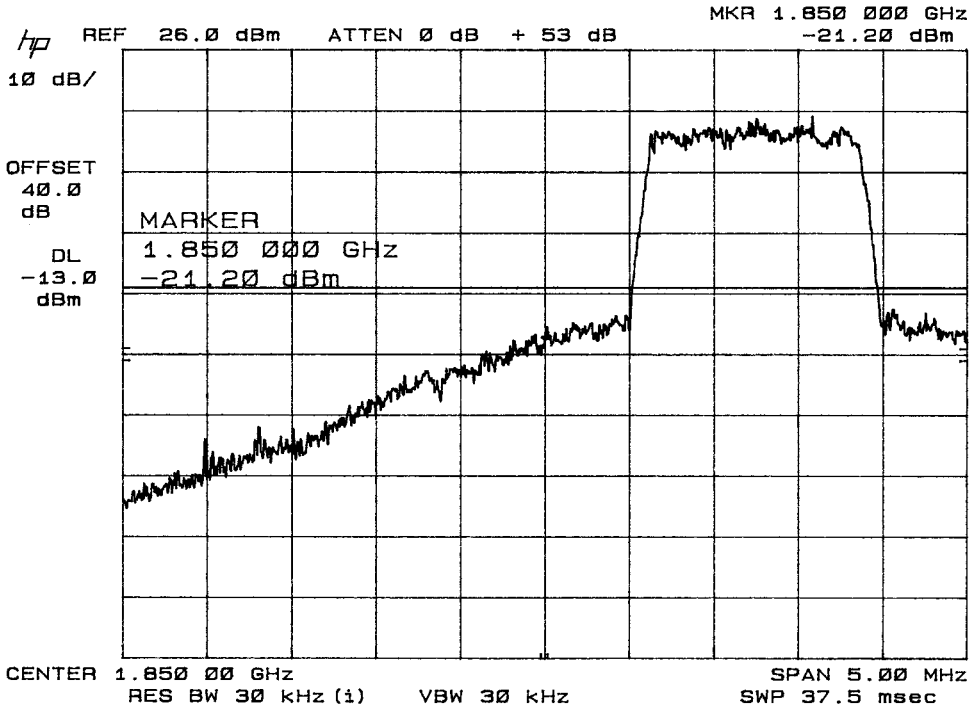

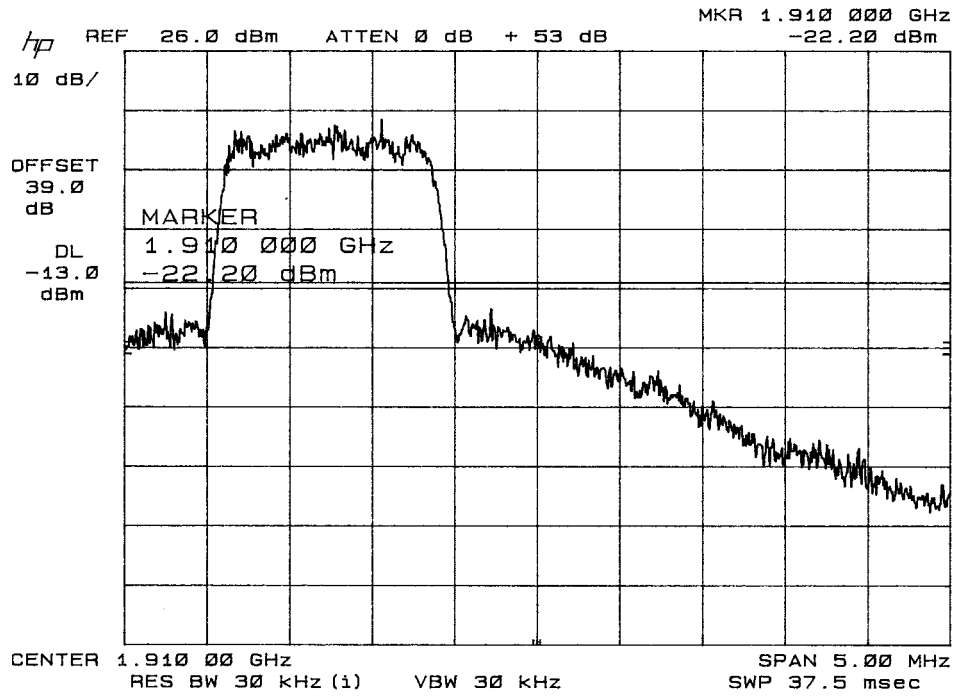

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22.917 (f) **Mobile emissions in base frequency range:**

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed – 80 dBm at the transmit antenna connector.

The Low, Mid, and High channels were tested. The worst-case emissions is reported:

No significant emissions found

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2.1051 Spurious emissions at antenna terminals:

Data on the following page shows the level of conducted spurious responses. For analog modulation, the carrier was modulated 100% using a 2500 Hz tone. For digital modulation, the carrier is modulated to its maximum extent. The spectrum was scanned from 9kHz to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

REQUIREMENTS: Emissions must be 43 +10log(Po) dB below the mean power output of the transmitter.
43 + 10log(0.4) = 39 dB

PCS 1900

EMISSION FREQUENCY MHz Low Channel	dB BELOW CARRIER (dBc) HIGH POWER
1851	0
3702	60.9
5553	65
7404	68
9255	70
1880	0
3760	61
5640	66
7520	66
9400	72
1908	0
3816	62
5724	65
7632	70
9540	72

Note: 1: Emissions were tested to the tenth harmonic.

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REQUIREMENTS: Emissions must be 43 +10log(Po) dB below the mean power output of the transmitter.
43 + 10log(.89) = 42.5 dB

CDMA 850

EMISSION FREQUENCY MHz Low Channel	dB BELOW CARRIER (dBc) HIGH POWER
836	0
1672	60.4
2508	67
3344	71.4
4180	66.7
848	0
1696	59.8
2544	66
3392	70
4240	67
825	0
1650	59.4
2475	70.1
3300	72
4125	68.6

Note: 1: Emissions were tested to the tenth harmonic.

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Data on the following page shows the level of conducted spurious responses. For analog modulation, the carrier was modulated 100% using a 2500 Hz tone. For digital modulation, the carrier is modulated to its maximum extent. The spectrum was scanned from 9kHz to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

REQUIREMENTS: Emissions must be 43 +10log(Po) dB below the mean power output of the transmitter.
43 + 10log(0.4) = 39 dB

AMPS

EMISSION FREQUENCY MHz Low Channel	dB BELOW CARRIER (dBc) HIGH POWER
836	0
1672	62
2508	68.7
3344	70.1
4180	69.4
848.9	0
1697.8	60.8
2546.7	70
3395.6	70.2
4244.5	69.7
824.9875	0
1649.9	60.5
2474.9	69.1
3299.9	69.7

Note: 1: Emissions were tested to the tenth harmonic.

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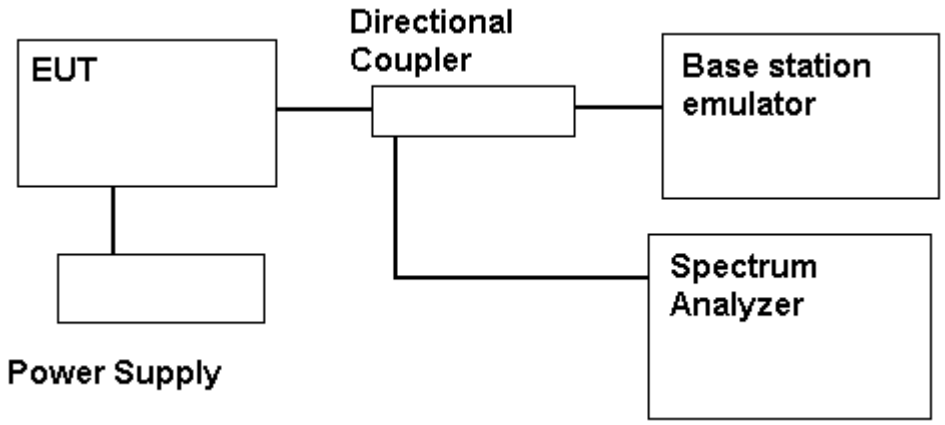
Method of Measuring Conducted Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was TIA/EIA-603 STANDARD without any exceptions. An audio generator was connected to the UUT through a dummy microphone circuit and the output of the transmitter connected to a standard load and from the standard load through a pre-selector filter of the spectrum analyzer. The spectrum was scanned from 9 kHz to at least the tenth harmonic of the fundamental using a Agilent model 8566B spectrum analyzer. The measurements were made using the shielded room located at TIMCO ENGINEERING INC.
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2.1053 **Field strength of spurious emissions**:

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: Emissions must be 43 + 10log(Po) dB below the mean power output of the transmitter.

43 + 10log(.4) = 39 dB

TEST DATA: CDMA PCS 1800

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
1850.20	V	21.40	1.1	5.16	0
3700.40	V	-32.70	1.41	7.55	52.02
5550.60	V	-29.50	1.73	8.42	48.27
7400.80	V	-35.90	2.04	8.47	54.93

Note: 1: Emissions were tested to the tenth harmonic.
2: Three places in the band were tested and the worst case presented.

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2.1053 **Field strength of spurious emissions**:

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: Emissions must be 43 + 10log(Po) dB below the mean power output of the transmitter.

43 + 10log(.89) = 42.5 dB

TEST DATA: AMPS

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
836.60	V	29.20	0	-1.06	0
1673.20	V	-30.10	1.08	5.05	54.27
2509.80	V	-31.30	1.22	6.86	53.8
3346.40	V	-30.90	1.36	7.46	52.94
4183.00	V	-30.20	1.5	7.84	52

Note: 1: Emissions were tested to the tenth harmonic.
2: Three places in the band were tested and the worst case presented.

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2.1053 **Field strength of spurious emissions**:

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: Emissions must be 43 + 10log(Po) dB below the mean power output of the transmitter.

43 + 10log(.4) = 39 dB

TEST DATA: CDMA 850

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
824.20	V	25.90	0	-1.15	0
1648.40	V	-26.70	1.07	5.04	47.48
2472.60	V	-29.10	1.21	6.76	48.3
3296.80	V	-31.70	1.35	7.43	50.37
4121.00	V	-31.90	1.49	7.74	50.4

Note: 1: Emissions were tested to the tenth harmonic.
2: Three places in the band were tested and the worst case presented.

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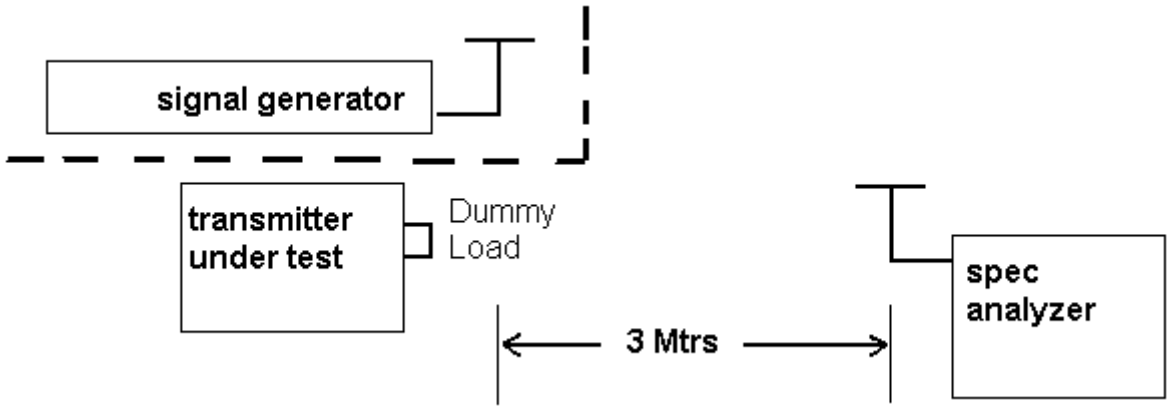
Method of Measuring Radiated Spurious Emissions



Equipment placed 80 cm above ground
on a rotating table platform.

METHOD OF MEASUREMENTS: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.

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2.1055 Frequency stability:

Measurement techniques have been in accordance with TIA/EIA STD 603-1992.

22.355: Frequency stability

Temperature and voltage tests were performed to verify that the frequency remains within the .00025%, 2.5 ppm specification limit for Base fixed unit. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25° C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15-second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30° C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15-second intervals. The worst case number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to + 50 degrees C.

MEASUREMENT DATA:

CDMA 850

Ref. Freq.
835.890006

TEMPERATURE °C	FREQUENCY MHz	PPM
-30C	835.889922	-0.10
-20C	835.889916	-0.11
-10C	835.889935	-0.08
0C	835.889945	-0.07
10C	835.889967	-0.05
20C	835.890000	-0.01
30C	835.890011	0.01
40C	835.890095	0.11
50C	835.890101	0.11

Batt. Volts	Batt. Data	PPM
85%	835.890006	0.00
115%	835.890006	0.00

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MEASUREMENT DATA:

CDMA PCS 1900
Ref.Freq.1880.000002

TEMPERATURE °C	FREQUENCY MHz	PPM
-30C	1879.999786	-0.11
-20C	1879.999810	-0.10
-10C	1879.999830	-0.09
0C	1879.999850	-0.08
10C	1879.999870	-0.07
20C	1880.000009	0.00
30C	1880.000060	0.03
40C	1880.000080	0.04
50C	1880.000160	0.08

Batt. Volts	Batt. Data	PPM
85%	1880.000002	0.00
115%	1880.000002	0.00

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MEASUREMENT DATA:

Ref. Freq.
836.520006

TEMPERATURE °C	FREQUENCY MHz	PPM
-30C	836.519956	-0.06
-20C	836.519939	-0.08
-10C	836.519930	-0.09
0C	836.519964	-0.05
10C	836.519979	-0.04
20C	836.520006	0.00
30C	836.520056	0.06
40C	836.520072	0.08
50C	836.519956	-0.06

Batt. Volts	Batt. Data	PPM
85%	836.520006	0.00
115%	836.520006	0.00

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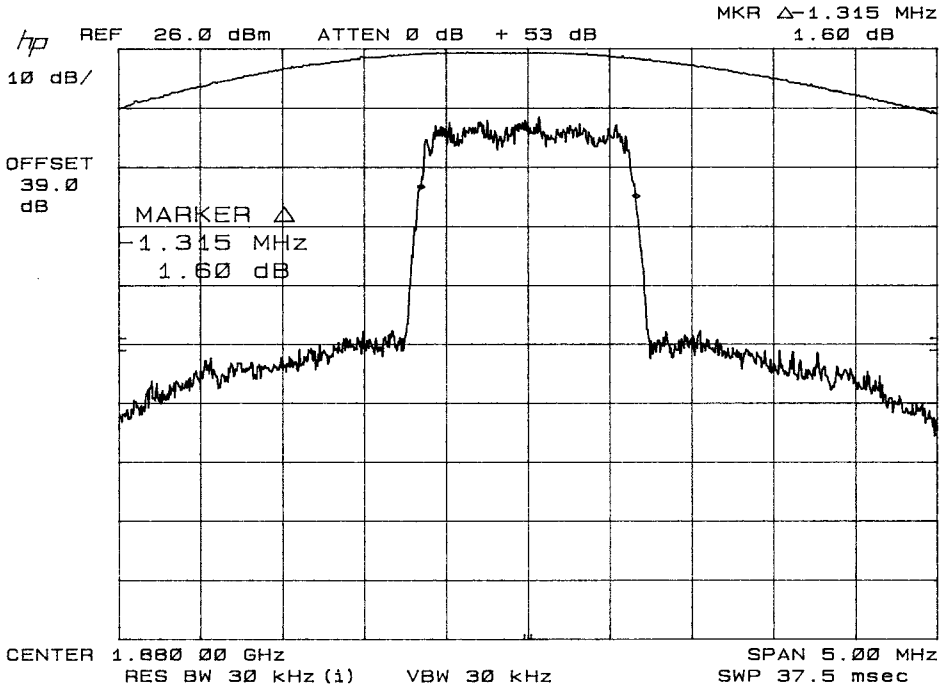
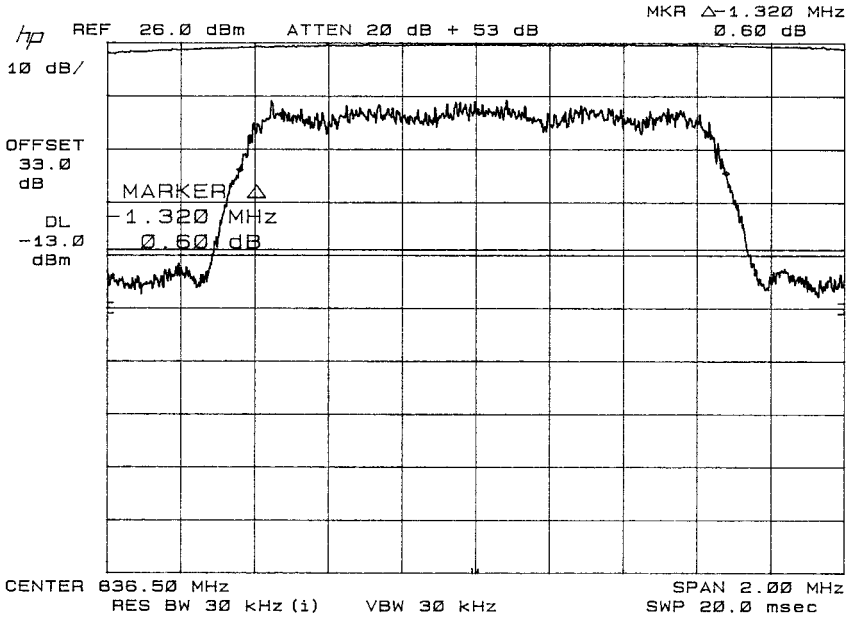
2.1049 Occupied Bandwidth

CDMA PCS 1900



CDMA 800



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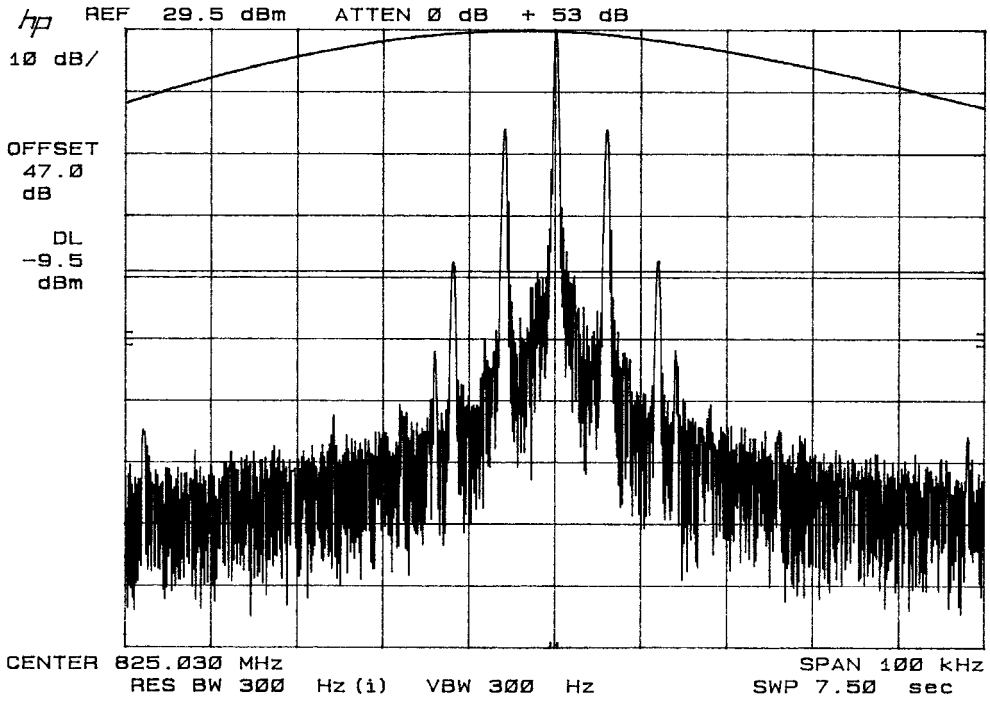

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RF Exposure

The module is intended as an OEM drop in device for cellular service handsets and probable/mobile devices. As such the RF exposure will have to be addressed in the filing of the final product. SAR evaluation also will have to be addressed for handheld applications.

MPE calculation for 850 MHz

For a 890 mW (29.5 dBm) transmitter and a antenna gain of 3 dBd in the 850 MHz band. No coax cable loss was accounted for in the calculation.

$Po := 890$ mWatts $dBd := 3$ antenna gain $f := 850$ Frequency in MHz

$G := dBd + 2.1$ gain in dBi

$Gn := 10^{\frac{G}{10}}$ gain numeric $S := \frac{f}{1500}$

$Gn = 3.236$ $S = 0.567 \ \frac{mW}{cm^2}$

$$R := \sqrt{\frac{(Po \cdot Gn)}{(4 \cdot \pi \cdot S)}} \qquad Rinches := \frac{R}{2.54}$$

$R = 20.111$ distance in centimeters required for compliance $Rinches = 7.918$

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MPE calculation for 1900 MHz

For a 400 mW (26 dBm) transmitter and a antenna gain of 8 dBd in the 1900 MHz band.
No coax cable loss was accounted for in the calculation.
The limit for power density (S) at frequencies above 1500 MHz is 1.

$Po := 400$ mWatts $dBd := 8$ antenna gain $f := 1500$ Frequency in MHz

$G := dBd + 2.1$ gain in dBi

$Gn := 10^{\frac{G}{10}}$ gain numeric $S := \frac{f}{1500}$

$Gn = 10.233$ $S = 1$ $\frac{mW}{cm^2}$

$$R := \sqrt{\frac{(Po \cdot Gn)}{(4 \cdot \pi \cdot S)}} \qquad Rinches := \frac{R}{2.54}$$

$R = 18.048$ distance in centimeters required for compliance $Rinches = 7.105$

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EMC Equipment List

Device	Manufacturer	Model	Due Date or Status
3-Meter OATS	TEI	N/A	1/12/06
3/10-Meter OATS	TEI	N/A	3/26/07
Tan Tower Spectrum Analyzer	HP	8566B Opt 462	9/23/05
Tan Tower RF Preselector	HP	85685A	9/23/05
Tan Tower Quasi-Peak Adapter	HP	85650A	9/23/05
Tan Tower Preamplifier	HP	8449B-H02	9/23/05
Blue Tower Spectrum Analyzer	HP	8568B	4/13/07
Blue Tower RF Preselector	HP	85685A	4/13/07
Blue Tower Quasi-Peak Adapter	HP	85650A	4/13/07
Silver Tower Spectrum Analyzer	HP	8566B Opt 462	12/8/06
Silver Tower RF Preselector	HP	85685A	4/27/06
Silver Tower Quasi-Peak Adapter	HP	85650A	12/8/06
Silver Tower Preamplifier	HP	8449B	3/22/06
Biconnical Antenna	Electro-Metrics	BIA-25	4/29/07
Biconnical Antenna	Eaton	94455-1	8/17/06
Biconnical Antenna	Eaton	94455-1	3/18/05
Log-Periodic Antenna	Electro-Metrics	LPA-25	8/26/06
Log-Periodic Antenna	Electro-Metrics	LPA-30	out for cal
Log-Periodic Antenna	Eaton	96005	5/8/05
Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4	3/21/04
Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4	9/26/05
Double-Ridged Horn Antenna	Electro-Metrics	RGA-180	12/29/06
Horn Antenna *(at 3 meters)	Electro-Metrics	EM-6961	3/31/05
Horn Antenna *(at 10 meters)	Electro-Metrics	EM-6961	6/4/05
Harmonic Mixer with Horn Antenna	Oleson Microwave Labs	M08HW/A	4/25/05