Serial No. GM26044f
FCC ID: J2MPM4

FCC TEST REPORT FOR THE CONCEPT2, INC. MODEL PM4 PERFOMANCE MONITOR FOR ROWING MACHINES

Prepared for:

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Submitted by:

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Concept2, Inc.
FCC Tests
At
Green Mountain Electromagnetics, Inc.
Middlebury, Vermont

Unit: Model PM4 Performance Monitor for Rowing Machines
Received: June 23, 2006
Tested: June 23- July 10, 2006

I. Applicable Standards:

The unit described in this report was measured for certification with the Code of Federal Regulations Chapter 47 – "Telecommunication, Part 2 – Frequency Allocations and Radio Treaty Matters: General Rules and Regulations, Subpart J – Equipment Authorization Procedures (2002)." Measurements required were per paragraphs:
2.1046 RF Power Output,
2.1047 Modulation Characteristics,
2.1049 Occupied Bandwidth,
2.1051 Spurious Emissions at Antenna Terminals,
2.1053 Field Strength of Spurious Radiation,
2.1055 Frequency Stability,
2.1091 Radiofrequency Radiation Exposure Evaluation: Mobile Devices.

Additionally, the unit was measured for verification of compliance with CFR47, Part 15 – "Radio Frequency Devices, Subpart C: Intentional Radiators," paragraphs 15.209, Radiated Emissions Limits and 15.247/249, Operation within the Bands 902-928MHz, 2400-2483.5 MHz, 5725-5875 MHz and 24.0-24.25 GHz.

Measurement procedures were in accordance with ANSI C63.4, "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2003)" and FCC OET Bulletin 65, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields (August 1997)."

II. Unit Tested:

The Concept2, Inc. Model PM4 is a performance monitor used in rowing machines for data logging/analysis and battery recharging. The PM4 uses DC battery power and is controlled by a front-panel, LCD touchpad interface. The PM4 consists of the plastic enclosure, signal connectors, the electronics, and the power input circuit. It is intended for use in a residential environment. The unit was operated during testing using portions of a rowing machine. The table below describes the unit tested to determine compliance with the standards:

Model	Manufacturer	Serial Number
PM4	Concept2, Inc.	310000001

The following table describes the system physical and electrical properties:

Model	Volts/Amps/Hertz	H/W/D in cm
PM4	(2) 1.2-VDC NIMH batteries	13/12/7

The following table describes the support equipment:

Model	Manufacturer	Serial Number
PM4	Concept2, Inc.	310000002

Unshielded cables were used for testing and are not supplied by the manufacturer. The following table describes the system cables:

Cable	Part Number	Description
Interface	UL E132276A	Unshielded Ethernet

The highest frequency investigated is ten times the highest fundamental (24 GHz).

III. Summary of Results:

The Concept2, Inc. Model PM4 complies with the requirements in CFR 47, Paragraphs 2, and 15. Section IX contains the results summarized in the table below.

	Test	Mode/Port	CFR 47 Paragraph	Frequency Range/	Specified Values	Measured Values
1	RF Power Output	Transmit	**2.1046** **15.247**	2400-2483.5 MHz	<30 dBm (1 Watt)	-7 dBm
2	Modulation Characteristics	Transmit	**2.1047** **15.247**	2400-2483.5 MHz	>75 Frequencies	>75
3	Occupied Bandwidth	Transmit	**2.1049** **15.247**	2400-2483.5 MHz	20 dB down at 100 kHz from band edges	Within Limit
4	Conducted Spurious	Receive/ Transmit	**2.1051** **15.247**	Below 24 GHz	8 dBm	<8 dBm
5	Frequency Tolerance	Transmit	**2.1055**	2400-2483.5 MHz	Battery End Point - 2.2 V	2.2V
6	Radiated Emissions	Enclosure	**15.209** **15.249**	30 - 88 MHz 88 - 216 MHz 216 - 960 MHz 0.960 - 24 GHz Fundamental	40 dBuV/m 43.5 dBuV/m 46 dBuV/m 54 dBuV/m 94 dBuV	Within All Limits
7	Exposure Evaluation	Enclosure	**2.1091**	0.3 - 3 MHz 3 - 30 MHz 30 - 300 MHz 300 - 1500 MHz 1.5 - 24 GHz	100 mW/cm^2 900/f^2 mW/cm^2 1 mW/cm^2 f/300 mW/cm^2 5 mW/cm^2	Within All Limits

Table 1 – Summary of Test Results

Testing was performed by Kyle R. Kowalczyk, president, Green Mountain Electromagnetics and requested by:

Microprocessor Designs, Inc.
65 Longmeadow Drive
Shelburne, VT 05482
USA

KRK

Kyle R. Kowalczyk
7/10/06

IV. Measurement Location:

The GME laboratory and Open Area Test Site (OATS) are located at 219 Blake Roy Road, Middlebury, VT. The OATS is a 3-meter site complete with antenna positioner, ground plane and motorized turntable. The OATS is constructed in accordance with ANSI C63.7-1992 and complies with the requirements for radiated emissions testing in ANSI C63.4-2003 and CISPR 16-1993. The electromagnetic laboratory is constructed in accordance with CE immunity standards and ANSI C63.4-2003 (conducted emissions).

GME is internationally accredited by the American Association for Laboratory Accreditation (A2LA) and meets the quality requirements in ISO/IEC 17025 (2005), "General Requirements for the Competence of Testing and Calibration Laboratories."

V. Measuring Equipment:

The table below describes the instrumentation used by Green Mountain Electromagnetics to perform this testing:

Unit	Manufacturer	Model	Serial #	Last Cal.	Next Cal.
Spectrum Analyzer	Hewlett-Packard	8592	3624A00631	3/8/06	3/8/07
Amplifier	Hewlett-Packard	8447 D	2944A07313	6/1/06	6/1/07
Plotter	Hewlett-Packard	7475A	2517A05281	n/a	n/a
Broadband E-field Antenna	Antenna Research Associates	LPB-2513/A	1125	11/14/05	11/14/06
Horn Antenna	EMCO	3115	2418	11/14/05	11/14/06

VI. Equipment and Cable Configuration:

GME witnessed the unit in satisfactory condition for testing, however the manufacturer is responsible for ensuring that the equipment under test (EUT) represents the product line. The manufacturer is also responsible for the EMC test plan and for assuring that this report is consistent with that plan. The EUT configuration was arranged to produce maximum radiated emissions as shown in the block diagram below, as well as in the photographs in Section VIII. The equipment was subjected to complete emissions tests.

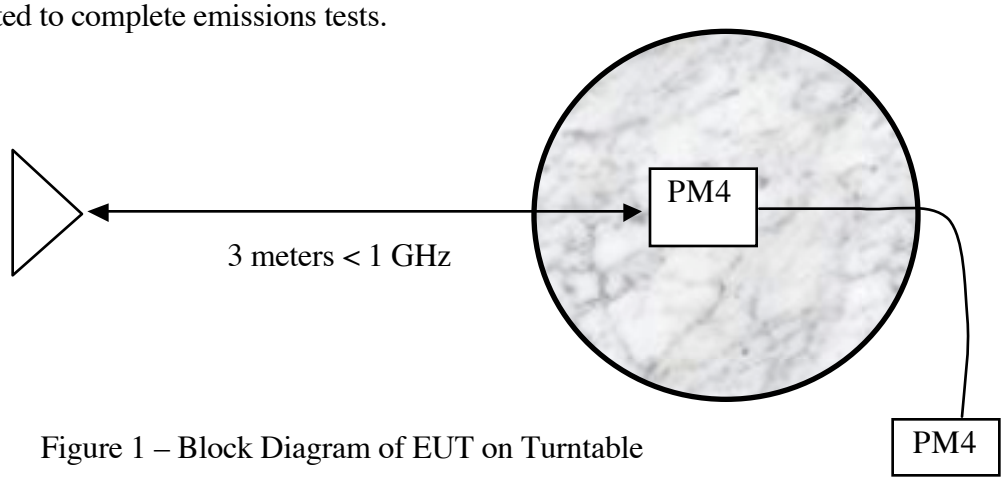


Figure 1 – Block Diagram of EUT on Turntable

The EUT was operating in a continuous mode utilizing and testing its RF signal processing functions. The unit was also set to self-test upon power up.

The GME measurement uncertainty is available upon request.

VII. Measurement Procedures:

1. RF Power Output.

Specification: < 30 dBm (1W) Normal Operation

a. Set up EUT and test instrumentation at OATS.
   i. Connect EUT to power and operate companion unit.
b. Verify spectrum analyzer and EUT operation.
   i. Use internal spectrum analyzer attenuator.
c. Operate EUT at high power unmodulated.
d. Record power level displayed on analyzer in dBm.
e. Remove EUT from site and attach signal generator to substitution antenna.
f. Determine signal necessary to replicate EUT signal and record.

2. Modulation Characteristics.

Specification: 75 frequencies Normal Operation

a. Set up EUT and test instrumentation in laboratory.
   i. Connect EUT to 2.4-VDC power; use 30-dB attenuator to antenna port.
b. Verify analyzer and EUT operation.
   i. Spectrum analyzer is set to use 30-dB attenuator.
   ii. Appropriate test signals are selected.
   iii. Spectrum analyzer requires warm-up period.
c. Verify EUT frequency with spectrum analyzer.
d. Operate EUT at high power, use modulated signal.
e. Record characteristics displayed on meter.

3. Occupied Bandwidth.

Specification: 20 dB down, 100 kHz from band edge

a. Set up EUT and test instrumentation in laboratory.
   i. Connect EUT to 2.4-VDC power.
b. Verify analyzer and EUT operation.
   i. Spectrum analyzer is set to use 30-dB attenuator.
   ii. Appropriate test signals are selected.
   iii. Spectrum analyzer requires warm-up period.
c. Verify EUT high- and low-band edge frequencies with spectrum analyzer.
d. Operate EUT at high power, use modulated signal.
e. Record amplitude at band edges displayed on meter.

VII. Measurement Procedures Cont'd:

4. Conducted Spurious.

Specification: Below 24 GHz = 8 dBm

a. Set up EUT and test instrumentation in laboratory.
   i. Connect EUT to 2.4-VDC power.

b. Verify analyzer and EUT operation.
   i. Spectrum analyzer is set to use auto attenuator.
   ii. Appropriate test signals are selected.
   iii. Spectrum analyzer requires warm-up period.

c. Operate EUT at high power, use modulated signal.

d. Record conducted spurious over entire band.

5. Frequency Tolerance.

Frequency Band: 2400-2483.5 MHz

Voltage Specification: Battery end point (2.2V) Normal Operation

a. Set up EUT and test instrumentation in laboratory.
   i. Connect EUT to 2.2-VDC power; use 30-dB attenuator to antenna port.

b. Verify analyzer and EUT operation.
   i. Spectrum analyzer is set to use 30-dB attenuator.
   ii. Appropriate test signals are selected.
   iii. Spectrum analyzer requires warm-up period.

c. Verify EUT high- and low-band edge frequencies with spectrum analyzer.

d. Operate EUT at high power, use modulated signal.

e. Record conducted spurious over entire band.

g. Record frequency displayed on spectrum analyzer.
   i. Sweep voltage from low to high and observe any variation in frequency.

VII. Measurement Procedures Cont'd:

6. Radiated Emissions.

Frequency range: 30 MHz to 88 MHz
Limit: 40 dBuV/m @ 3 meters
Frequency range: 88 kHz to 216 MHz
Limit: 43.5 dBuV/m @ 3 meters
Frequency range: 216 MHz to 960 MHz
Limit: 46 dBuV/m @ 3 meters
Frequency range: 960 MHz to 24 GHz
Limit: 54 dBuV/m @ 3 meters
Fundamental: 2400 MHz
Limit: 94 dBuV/m @ 3 meters

a. Set up instrumentation at open area test site.
   i. Mount EUT on turntable and broadband antenna on antenna positioner.
   ii. Observe temperature, humidity and atmospheric pressure.
   iii. Measurement distance is 3 meters and antenna scan height is varied from 1 to 4 meters.
b. Verify spectrum analyzer and antenna operation.
   i. Spectrum analyzer is connected to antenna.
   ii. Preamplifier is inserted between antenna and analyzer to ensure analyzer noise threshold is at least 6 dB below specification limit (not normally necessary below 30 MHz).
c. Set up, power and operate EUT as described in Section VI.
d. Perform preliminary evaluation of equipment in the near field.
   i. Vary antenna height, antenna polarization, and antenna orientation to EUT.
   ii. Repeat step d.i. while evaluating electromagnetic radiation in the 30-MHz to 24-GHz spectrum.
   iii. Ensure appropriate resolution bandwidth is set and less than or equal to video bandwidth.
   iv. Near field measurements of unit emissions are made at ambient frequencies.
e. Determine frequencies and equipment orientations that produce maximum radiation.
   i. Identify any processor, clock and beat frequencies, and harmonics.
f. Perform final evaluation of unit by recording spectrum analyzer data on the plotter.
   i. Ensure the EUT is producing the maximum radiation found in step e.
   ii. Collect data over the entire frequency range.
   iii. Identify all ambient signals.

VII. Measurement Procedures Cont'd:

7. Exposure Evaluation.

Frequency range: 0.3 MHz - 3 MHz
Limit: 100 mW/cm^2
Frequency range: 3 MHz - 30 MHz
Limit: 900/f^2 mW/cm^2
Frequency range: 30 MHz - 300 MHz
Limit: 1 mW/cm^2
Frequency range: 300 MHz - 1500 MHz
Limit: f/300 mW/cm^2
Frequency range: 1500 MHz - 24,000 MHz
Limit: 5 mW/cm^2

a. Set up instrumentation at open area test site.
   i. Mount EUT on table and isotropic probe or loop on antenna positioner.
   ii. Observe temperature, humidity and atmospheric pressure.
   iii. Measurement distance is 1 meter and antenna scan height is varied over human body dimensions (0.1 to 2 meters).
b. Verify spectrum analyzer and antenna operation.
   i. Spectrum analyzer is connected to antenna.
   ii. Preamplifier is inserted between antenna and analyzer to ensure analyzer noise threshold is at least 6 dB below specification limit (not normally necessary below 30 MHz).
c. Set up, power and operate EUT as described in Section VI.
d. Perform preliminary evaluation of equipment in the near field.
   i. Vary antenna height, antenna polarization, and antenna orientation to EUT.
   ii. Repeat step d.i. while evaluating electromagnetic radiation in the 0.3-MHz to 24,000-MHz spectrum. H and E field are both measured below 300 MHz.
   iii. Ensure appropriate resolution bandwidth is set and less than or equal to video bandwidth.
   iv. Near field measurements of unit emissions are made at ambient frequencies.
e. Determine frequencies and equipment orientations that produce maximum radiation.
   i. Set peak hold on analyzer for 6 minutes while slowly varying antenna height.
f. Perform final evaluation of unit by recording spectrum analyzer data on the plotter.
   i. Ensure the EUT is producing the maximum radiation found in step e.
   ii. Collect data over the entire frequency range.
   iii. Identify all ambient signals.

VIII. Test Setup Photographs for FCC Tests:

see seperate cover

Radiated Emissions

IX. Measurement Results:

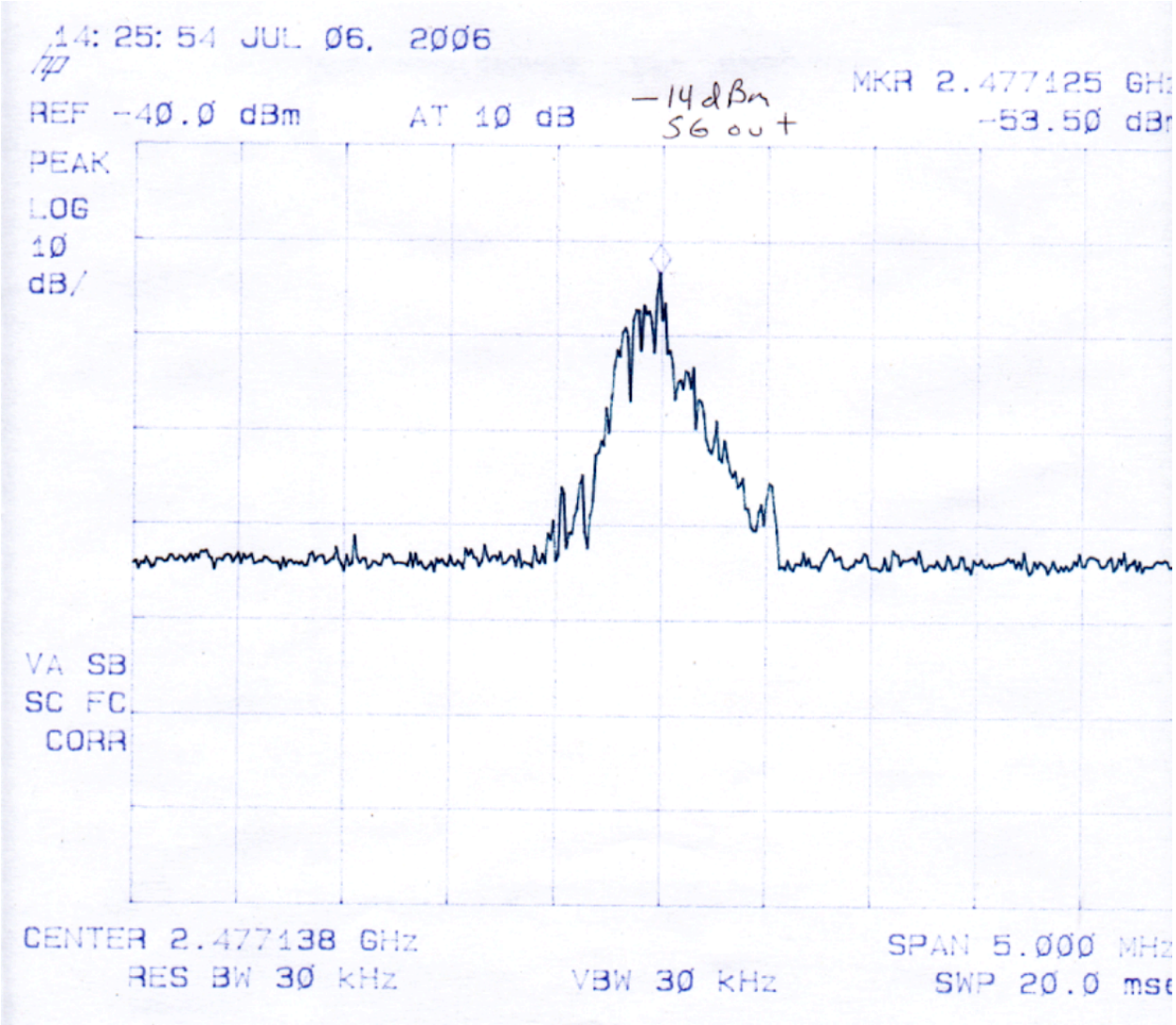
1. RF Power Output.

Specification: <30 dBm (<1 W)

Signal generator Output = -14 dBm to receive -53 dBm

RF Output (dBm) = Signal Generator Output (dBm) + Antenna Gain (dBi) – Cable Loss (dB).

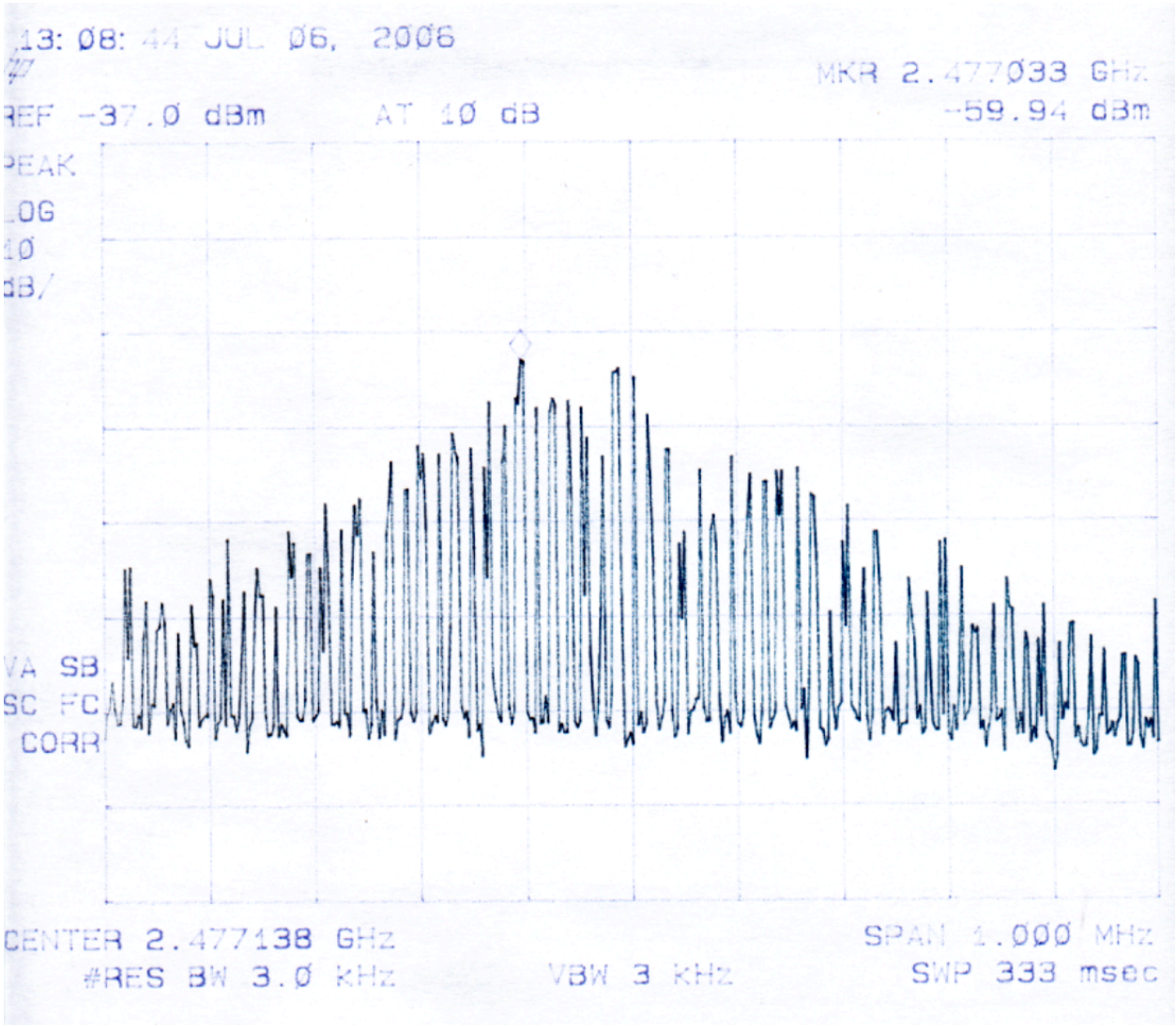
RF Output 2.4 GHz = **-7 dBm** = -14 dBm + 8.5 dBi – 1.5 dB.



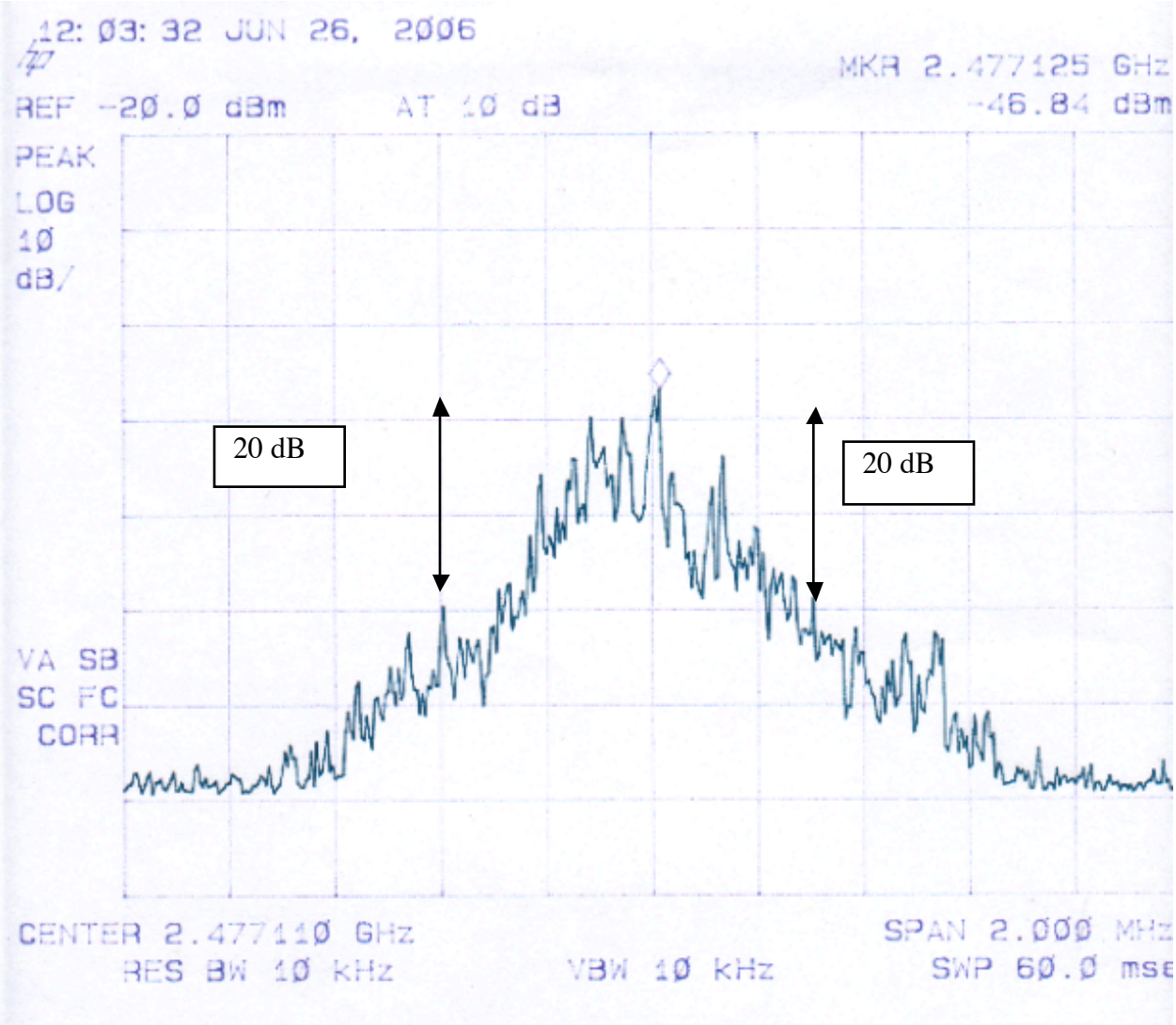
IX. Measurement Results Cont'd:

2. Modulation Spectrum.

Specification: 75 Frequencies



IX. Measurement Results Cont'd:

3. Occupied Bandwidth.

Specification: 20 dB at 100 kHz band edges