FCC TEST REPORT
FOR THE
INTERNATIONAL ELECTRONICS, INC.
HEADON WIRELESS HEADSET
EARPIECE

Prepared for:

International Electronics, Inc.
5913 NE 127 Ave.
Suite 800
Vancouver, Washington 98682

Submitted by:

Green Mountain Electromagnetics, Inc.

(802) 388-3390
Fax: (802) 388-6279
E-mail: gme@gmelectro.com
219 Blake Roy Road • Middlebury, Vermont 05753

Accredited
Cert 898.01

International Electronics, Inc.
FCC Tests
By
Green Mountain Electromagnetics, Inc.
Middlebury, Vermont

Unit: HeadOn Wireless Headset Earpiece
Evaluated: February 27 to March 9, 2003

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, and 2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices.

The unit was also measured for verification of compliance with "CFR47, Part 15 – Radio Frequency Devices, Subpart C: Intentional Radiators, Paragraph 15.209, Radiated Emissions Limits and Paragraph 15.247/249, Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz as applicable to digitally modulated intentional radiators (2002)."

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 (2000)," and FCC OET Bulletin 65, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields (August 1997)."

II. Unit Tested:

The International Electronics, Inc. HeadOn wireless headset earpiece is the portion of the wireless headset worn on the user. The HeadOn uses DC power and has a digitally modulated 916 MHz transmitter and receiver. It consists of the three-piece plastic enclosure with speaker hardware, the transmit/receive circuits, the electronics, and the antenna. The table below describes the unit tested to determine compliance with the standards:

Model/P/N	Manufacturer	H/W/D in cm	Serial Number
HeadOn Earpiece	International Electronics, Inc.	8/3/2	ENG001

The highest frequency investigated is ten times the HeadOn highest fundamental (9.16 GHz).

III. 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 C63.4-2000 and CISPR 16-1993. The electromagnetic laboratory is constructed in accordance with CE immunity standards and ANSI C63.4-2000 (conducted emissions).

GME is internationally accredited by the American Association for Laboratory Accreditation (A2LA) and meets the quality requirements in ISO/IEC 17025 (1999), "General Requirements for the Competence of Testing and Calibration Laboratories."

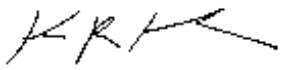
IV. Summary of Results:

The International Electronics, Inc.HeadOn wireless headset earpiece 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/Level	Specified Values	Measured Values
1	Carrier Power	Transmit	**2.1046** **15.247d**	916 MHz	< 8 dBm	-10 dBm
2	Modulation Characteristics	Transmit	**2.1047** **15.247a2**	500 kHz from carrier	>6 dB	10 dB
3	Occupied Bandwidth	Transmit	**2.1049** **15.247c**	100 kHz from edge of band	>20 dB	>20 dB
4	Conducted Spurious	Receive/ Transmit	**2.1051**	1 MHz to 9.16 GHz	attenuation >20 dB	>20 dB
5	Frequency Tolerance	Transmit	**2.1055**	Battery End Point	1.5 V	916 MHz
6	Radiated Emissions	Enclosure	**15.209** **15.249** **2.1053**	1.705 - 30 MHz 30 - 88 MHz 88 - 216 MHz 216 - 960 MHz 960 - 916 MHz 916 (Fund)	49.5 dBuV/m 40 dBuV/m 43.5 dBuV/m 46 dBuV/m 54 dBuV/m 94 dB uV	Within All Limits at 3meters
7	Exposure Evaluation	Enclosure	**2.1093**	916.4 MHz	0.08W/kg Body 1.6 W/kg 1g Vol	Within All Limits

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

International Electronics, Inc.
5913 NE 127 Ave.
Suite 800
Vancouver, WA 98682



Kyle R. Kowalczyk
3/10/04

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	1/13/04	1/13/05
Amplifier	Hewlett-Packard	8447 D	2944A07313	4/01/03	4/01/04
Signal Generator	Hewlett-Packard	E4421B	US38220195	10/17/03	10/17/04
Plotter	Hewlett-Packard	7475A	2517A05281	n/a	n/a
Broadband E-field Antenna	Antenna Research Associates	LPB-2513/A	1125	10/2/03	10/2/04

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 photograph 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 EUT was also set to self-test upon power up.

VII. Measurement Procedures for FCC Tests:

1. Carrier Power.

Specification: <8 dBm Normal Operation

a. Set up EUT and test instrumentation in laboratory.
   i. Connect EUT to battery power and operate companion unit.
b. Verify spectrum analyzer and EUT operation.
   i. Use internal spectrum analyzer attenuator.
c. Verify EUT frequency with non-contact probe and spectrum analyzer.
d. Operate EUT at high power unmodulated.
e. Record power level displayed on analyzer in dBm.

2. Modulation Characteristics.

Specification: >6dB at 500 kHz from carrier

a. Set up EUT and test instrumentation in laboratory.
   i. Connect EUT to battery power.
b. Verify analyzer and EUT operation.
c. Verify EUT test signal on spectrum analyzer.
d. Operate EUT at selected test signal with normal modulation.
e. Record frequency spectrum displayed on analyzer.

3. Occupied Bandwidth.

Specification: >20 dB at 100 kHz from edge of band

a. Set up EUT and test instrumentation in laboratory.
   i. Connect EUT to battery power and operate companion unit.
b. Verify spectrum analyzer and EUT operation.
   i. Use internal spectrum analyzer attenuator.
c. Verify EUT frequency with non-contact probe and spectrum analyzer.
d. Operate EUT at power unmodulated.
e. Record level displayed on analyzer.

4. Conducted Spurious.

Specification: attenuation >20 dB

a. Set up EUT and test instrumentation in laboratory.
   i. Connect EUT to battery power and operate companion unit.
b. Verify spectrum analyzer and EUT operation.

i. Use internal spectrum analyzer attenuator.

c. Verify EUT frequency with non-contact probe and spectrum analyzer.

d. Operate EUT at normal power and modulation.

e. Record level displayed on analyzer.

5. Frequency Tolerance.

Frequenciy: 916 MHz

Voltage Specification: 1.5 VDC Battery Normal Operation

a. Set up EUT and test instrumentation in laboratory.

i. Connect EUT to DC power and operate companion unit.

b. Verify spectrum analyzer and EUT operation.

i. Use internal spectrum analyzer attenuator.

c. Verify EUT frequency with non-contact probe and spectrum analyzer.

d. Operate EUT at power unmodulated.

e. Record level displayed on analyzer.

i. Sweep voltage from low to high and observe any variation in frequency.

Block Diagram of Procedures 1-5.

VII. Measurement Procedures for FCC Tests Cont'd:

6. Radiated Emissions.

Frequency range: 1.7 MHz to 30 MHz
Limit: 49.5 dBuV/m @ 3 meters
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 9.16 GHz
Limit: 54 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. Record 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 1-MHz to 9.16-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 for FCC Tests Cont'd:

7. Exposure Evaluation.

Frequency: 916 MHz

Limit: 0.8 W/kg and 1.6 W/kg

a. Set up instrumentation at open area test site.
   i. Mount EUT on table and isotropic probe or loop on antenna positioner.
   ii. Record 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 at 916 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 30 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.

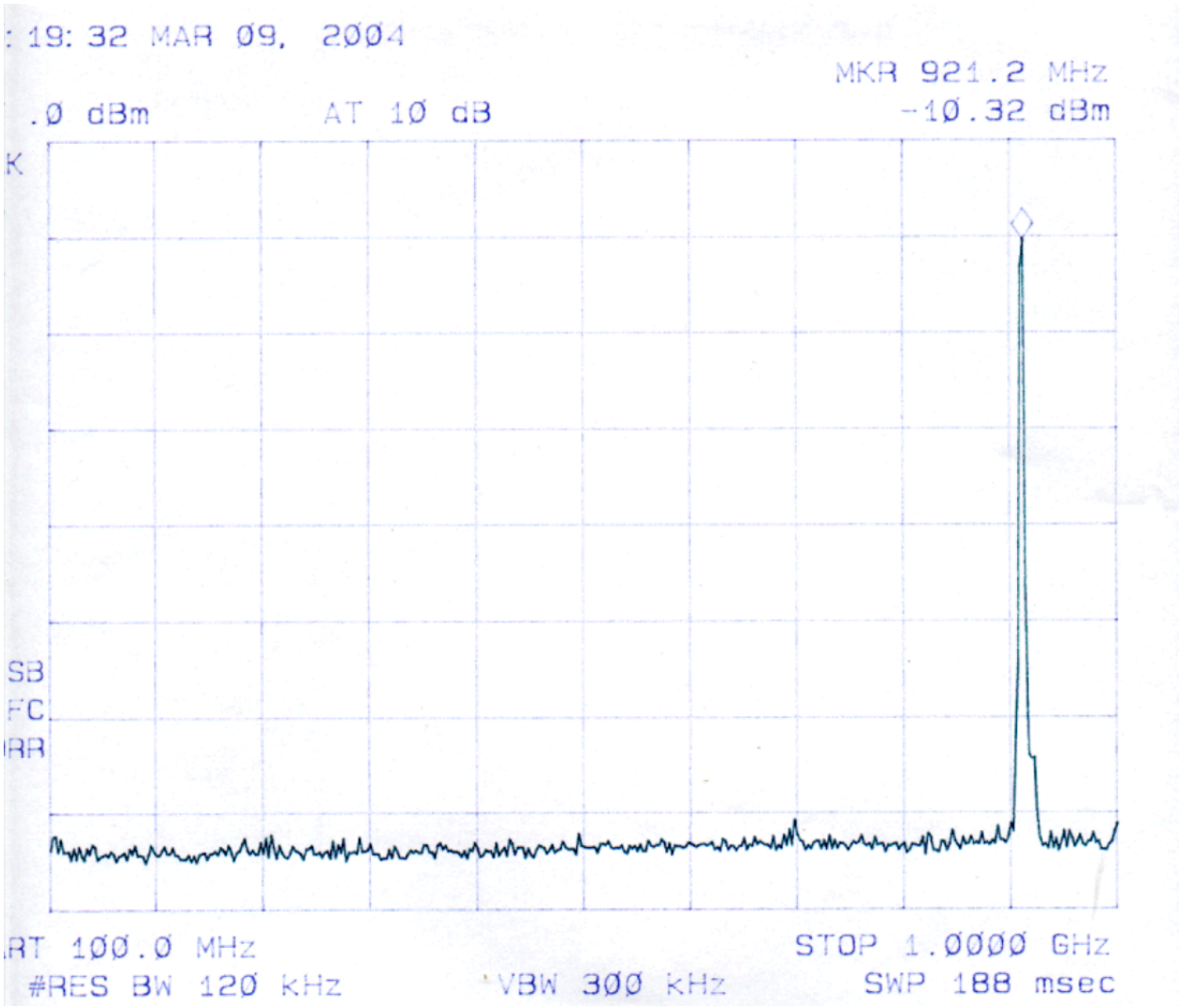
VIII. Test Setup Photograph for FCC Tests:

EUT Radiated Emissions

IX. Measurement Results for FCC Tests:

1. Carrier Power.

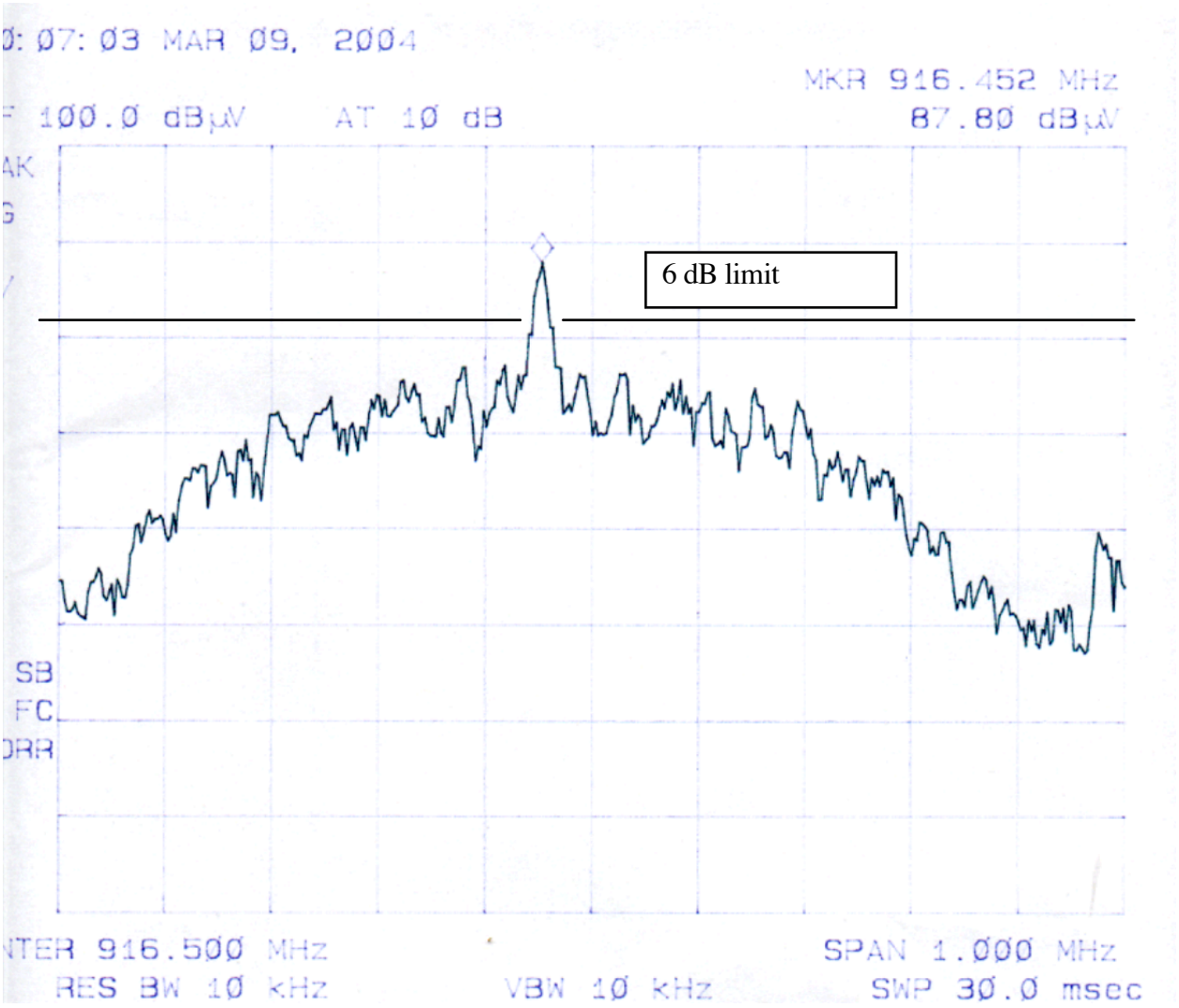
Specification: <8 dBm Normal Operation



IX. Measurement Results for FCC Tests Cont'd:

2. Modulation Spectrum

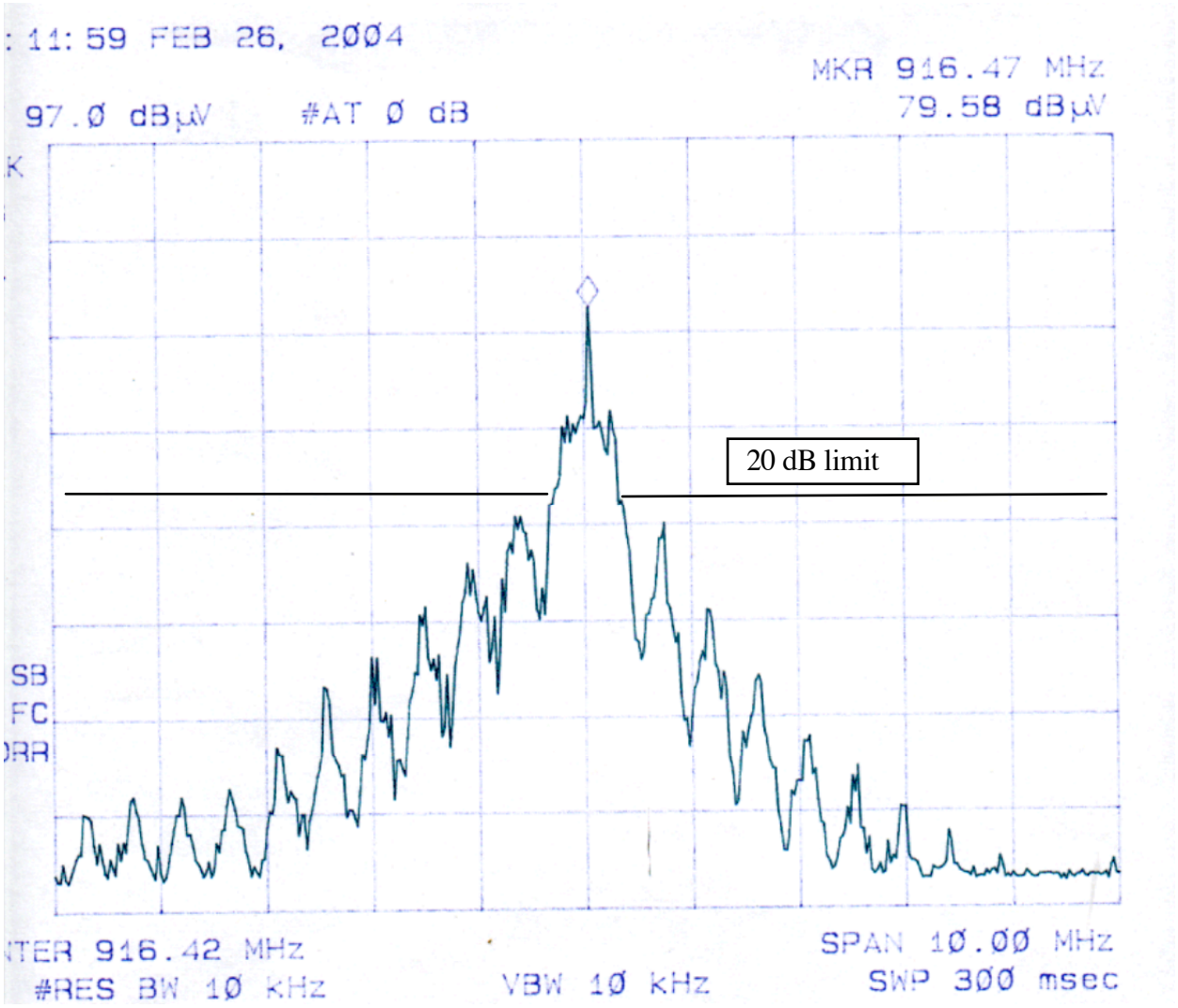
>6 dB at 500 kHz



IX. Measurement Results for FCC Tests Cont'd:

3. Occupied Bandwidth.

>20 dB at 100 kHz from edge



IX. Measurement Results for FCC Tests Cont'd:

4. Conducted Spurious.

Specification: Attenuation > 20 dB

******No conducted spurious measured within 20 dB. Analyzer noise threshold other than fundamental. ******

IX. Measurement Results for FCC Tests Cont'd:

5. Frequency Stability/Tolerance Cont'd.

Frequencies: 916.460MHz

Specification: 1.5 VDC through battery end Normal Operation

The table below shows no variation in frequency with selected applied voltage:

Voltage (VDC)	% Nominal	Frequency (MHz)
1.55	Nominal	916.460
1.54	Nominal	916.460
1.53	Nominal	916.460
1.52	Nominal	916.460
1.51	Nominal	916.460
1.50	Nominal	916.460
1.49	Nominal	916.460
1.48	Nominal	916.460
1.47	Nominal	916.460
1.46	Nominal	916.460
1.45	Nominal	916.460

IX. Measurement Results for FCC Tests Cont'd:

6. Radiated Emissions.

The table below contains the spectrum analyzer output and the correction factors necessary to apply the limit to the data.
Field (dBuV/m) = Vmeas (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) - Amp Gain (dB).
Deviation (dB) = Field (dBuV/m) - Limit (dBuV/m); Negative deviation is compliant.

Freq MHz	Pol H/V	RBW kHz	VBW kHz	Vmeas dBuV	AF dB1/m	Amp dB	Cable dB	Field dBuV/m	Dist dB	Limit dBuV/m	Dev dB
1	H	9	9	32	24.2	29	1	28.2	0	49.5	-21.3
1	V	9	9	31	24.2	29	1	27.2	0	49.5	-22.3
10	H	9	9	31	20.1	29	1	23.1	0	49.5	-26.4
10	V	9	9	32	20.1	29	1	24.1	0	49.5	-25.4
30	H	120	300	40	18.6	29	1	30.6	0	40	-9.4
30	V	120	300	39	18.6	29	1	29.6	0	40	-10.4
40	H	120	300	44	18.3	29	1	34.3	0	40	-5.7
40	V	120	300	46	18.3	29	1	36.3	0	40	-3.7
50	H	120	300	39	15.1	29	2	27.1	0	40	-12.9
50	V	120	300	40	15.1	29	2	28.1	0	40	-11.9
60	H	120	300	50	11.1	29	2	34.1	0	40	-5.9
60	V	120	300	47	11.1	29	2	31.1	0	40	-8.9
70	H	120	300	53	8.1	29	2	34.1	0	40	-5.9
70	V	120	300	51	8.1	29	2	32.1	0	40	-7.9
80	H	120	300	52	9.8	29	2	34.8	0	40	-5.2
80	V	120	300	44	9.8	29	2	26.8	0	40	-13.2
90	H	120	300	45	10.9	29	2	28.9	0	43.5	-14.6
90	V	120	300	41	10.9	29	2	24.9	0	43.5	-18.6
100	H	120	300	43.5	12.2	29	3	29.7	0	43.5	-13.8
100	V	120	300	43	12.2	29	3	29.2	0	43.5	-14.3
125	H	120	300	43.5	12.9	29	3	30.4	0	43.5	-13.1
125	V	120	300	42	12.9	29	3	28.9	0	43.5	-14.6

Table 1 – Corrected Radiated Emissions Data and FCC Limit

IX. Measurement Results for FCC Tests Cont'd:

6. Radiated Emissions Cont'd.

The table below contains the spectrum analyzer output and the correction factors necessary to apply the limit to the data.

Freq MHz	Pol H/V	RBW kHz	VBW kHz	Vmeas dBuV	AF dB1/m	Amp dB	Cable dB	Field dBuV/m	Dist dB	Limit dBuV/m	Dev dB
150	H	120	300	43.5	11.1	29	4	29.6	0	43.5	-13.9
150	V	120	300	43	11.1	29	4	29.1	0	43.5	-14.4
175	H	120	300	44	10.9	29	4	29.9	0	43.5	-13.6
175	V	120	300	45	10.9	29	4	30.9	0	43.5	-12.6
200	H	120	300	46	11.3	29	4	32.3	0	43.5	-11.2
200	V	120	300	43	11.3	29	4	29.3	0	43.5	-14.2
250	H	120	300	38	13.4	29	4	26.4	0	46	-19.6
250	V	120	300	39	13.4	29	4	27.4	0	46	-18.6
300	H	120	300	41	14.9	28	4	31.9	0	46	-14.1
300	H	120	300	41	14.9	28	4	31.9	0	46	-14.1
500	H	120	300	46	18.6	28	5	41.6	0	46	-4.4
500	V	120	300	45	18.6	28	5	40.6	0	46	-5.4
600	H	120	300	40	19.7	28	5	36.7	0	46	-9.3
600	V	120	300	43	19.7	28	5	39.7	0	46	-6.3
700	H	120	300	44	20.2	28	5.5	41.7	0	46	-4.3
700	V	120	300	43	20.2	28	5.5	40.7	0	46	-5.3
800	H	120	300	38	21.5	28	6	37.5	0	46	-8.5
800	V	120	300	39	21.5	28	6	38.5	0	46	-7.5
916	H	120	300	88	22.4	27	6	89.4	0	94	-4.6
916	V	120	300	87	22.4	27	6	88.4	0	94	-5.6
959	H	120	300	37	22.4	27	7	39.4	0	46	-6.6
959	V	120	300	39	22.4	27	7	41.4	0	46	-4.6
960	H	120	300	38	22.4	27	7	40.4	0	46	-5.6
960	V	120	300	37	22.4	27	7	39.4	0	46	-6.6

Table 1 Cont'd – Corrected Radiated Emissions Data and FCC Limit

IX. Measurement Results for FCC Tests Cont'd:

6. Radiated Emissions Cont'd.

The table below contains the spectrum analyzer output and the correction factors necessary to apply the limit to the data.

Freq MHz	Pol H/V	RBW kHz	VBW kHz	Vmeas dBuV	AF dB1/m	Amp dB	Cable dB	Field dBuV/m	Dist dB	Limit dBuV/m	Dev dB
1000	H	1000	1000	34	24.2	27	8	39.2	0	54	-14.8
1000	V	1000	1000	32	24.2	27	8	37.2	0	54	-16.8
1200	H	1000	1000	33	24.8	26	9	40.8	0	54	-13.2
1200	V	1000	1000	32	24.8	26	9	39.8	0	54	-14.2
1400	H	1000	1000	34	25.3	25	10	44.3	0	54	-9.7
1400	V	1000	1000	33	25.3	25	10	43.3	0	54	-10.7
1832	H	1000	1000	32	26.1	24	12	46.1	0	54	-7.9
1832	V	1000	1000	33	26.1	24	12	47.1	0	54	-6.9
2748	H	1000	1000	22	28.2	23	1	28.2	10.5	54	-15.3
2748	V	1000	1000	24	28.2	23	1	30.2	10.5	54	-13.3
3664	H	1000	1000	23	32.4	23	2	34.4	10.5	54	-9.1
3664	V	1000	1000	22	32.4	23	2	33.4	10.5	54	-10.1
4580	H	1000	1000	23	32.8	23	3	35.8	10.5	54	-7.7
4580	V	1000	1000	23	32.8	23	3	35.8	10.5	54	-7.7
5496	H	1000	1000	22	35.1	23	4	38.1	10.5	54	-5.4
5496	V	1000	1000	21	35.1	23	4	37.1	10.5	54	-6.4
6412	H	1000	1000	23	35.7	23	5	40.7	10.5	54	-2.8
6412	V	1000	1000	22	35.7	23	5	39.7	10.5	54	-3.8
7328	H	1000	1000	23	36.5	23	5	41.5	10.5	54	-2
7328	V	1000	1000	21	36.5	23	5	39.5	10.5	54	-4
8244	H	1000	1000	22	38.1	23	6	43.1	10.5	54	-0.4
8244	V	1000	1000	21	38.1	23	6	42.1	10.5	54	-1.4
9160	H	1000	1000	20	38.5	23	6	41.5	10.5	54	-2
9160	V	1000	1000	21	38.5	23	6	42.5	10.5	54	-1

Table 1 Cont'd – Corrected Radiated Emissions Data and FCC Limit

IX. Measurement Results for FCC Tests Cont'd:

7. Exposure Evaluation.

The analysis below compares the measured power to the maximum permissible exposure limit for general population with uncontrolled access. The unit can be used continuously, no special averaging time or limit relaxations are employed. Maximum peak available power is used in calculations.

Unit Frequency : 916.4 MHz
Unit Maximum Average Power .0001 Watt measured/ available
Standard user weight : 100 kg

Specific Absorption Rate (SAR) Limit for whole-body: 0.08 W/kg
Specific Absorption Rate (SAR) Limit for one-gram tissue volume: 1.6 W/kg

SAR Whole body = 100kg * .0001 W = 0.01 W/kg for HeadOn earpiece
SAR 1g tissue = .001 kg * = 0.000001W/kG for HeadOn earpiece

In addition per IEEE C95.1 paragraph 6.10 (2): low power devices are unlikely to expose users in excess of the criteria when power is less than or equal to:
Pmax = 1.4 * (450/f) Watts where f is in MHz.
Pmax is significantly greater than the power available at the HeadOn:
Pmax = 1.4 * (450/916.4) = 0.687 W.