Measurement/Technical Report

Otek Corporation, TR100

FCC ID:

February 25, 2000

This report concerns (check one): Original Grant √ Class II Change_____

Equipment Type: Intentional Radiator

Deferred grant requested per 47 CFR 0.457 (d)(1)(ii)? yes_____ no__X__

If yes, defer until: _____N/A_____ date

Otek Corporation agrees to notify the Commission by: _____N/A_____ date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37: yes_____ no__X__

If no, assumed Part 15, Subpart B for unintentional radiators - new 47 CFR [10-1-92] provision.

Report prepared by:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR 97124
(503) 844-4066
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Table of Contents

1.0 General Information

1.1 Product Description

Manufactured By ..... Otek Corporation

Address ..... 4016 E Tennessee Street, Tucson, AZ 85714-2130

Test Requested By: ..... Dr. Fest

Model TR100

FCC ID XXXTR100

Serial Number(s) 9919008

Date of Test ..... February 11, 2000 through February 25, 2000

Job Number OTEK0001

The Equipment Under Test (EUT) is the OtekTR100. The EUT is a wireless transceiver operating at 916.5 MHz only.

Hardware Description:

- Clocks/Oscillators Frequencies: 916.5 MHz, 22.118 MHz Clock
- Antenna: 1) Permanently attached (soldered) wire antenna
  2) Permanently attached (soldered) Whip Antenna

1.2 Related Submittals/Grants

None.

1.3 Tested System Details

EUT and Peripherals

Item	FCC ID	Description and Serial No.
EUT		Otek, TR100, Wireless Transceiver, Serial No. 9919008.
DC Power Supply		Energy One, model XD-4, Serial No. not available.
Function Generator		BK Precision, Model 4017, Serial No. 26000555.

Cables:

Item	Description
Power Input	meters in length. Not shielded and no ferrite beads. DC connector. Connected from the EUT to the DC Power Supply Adapter.
Power Supply Power	2.2 meters in length. Unshielded and no ferrites attached. AC Connector. Connected from the Power Supply to the AC Mains.
Function Generator Signal Cable	2.0 meter in length. Unshielded and no ferrites attached. BNC connector connected to the function generator, alligator clips attached to EUT.

1.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 (1992). Radiated testing was performed at an antenna to EUT distance of 3 meters. Please reference Appendix I for further detail on Test Methodology.

1.5 Test Facility

The certified chamber and conducted measurement facility used to collect the radiated and conducted data is located at

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The certified chamber, and conducted measurement facility used to collect this data is located at the address shown above. This site has been fully described in a report filed and accepted by the FCC. (31040/SIT)(1300B3). It is also recognized under the National Voluntary Laboratory Accreditation Program (NVLAP Lab Code: 200059-0) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations.

Northwest EMC, Inc. is recognized under the United States Department of Commerce, National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. NVLAP Lab Code: 200059-0.

2.0 System Test Configuration

2.1 Justification

The EUT was configured to simulate typical use. Cables were attached to each of the available I/O Ports. The mode of operation utilized for testing was selected in order to best simulate typical EUT use. The measurements were made with the EUT transmitting at it's only available channel.

2.2 EUT Exercise Software

Since there is no external data connection available, no external software can be used.

2.3 Special Accessories

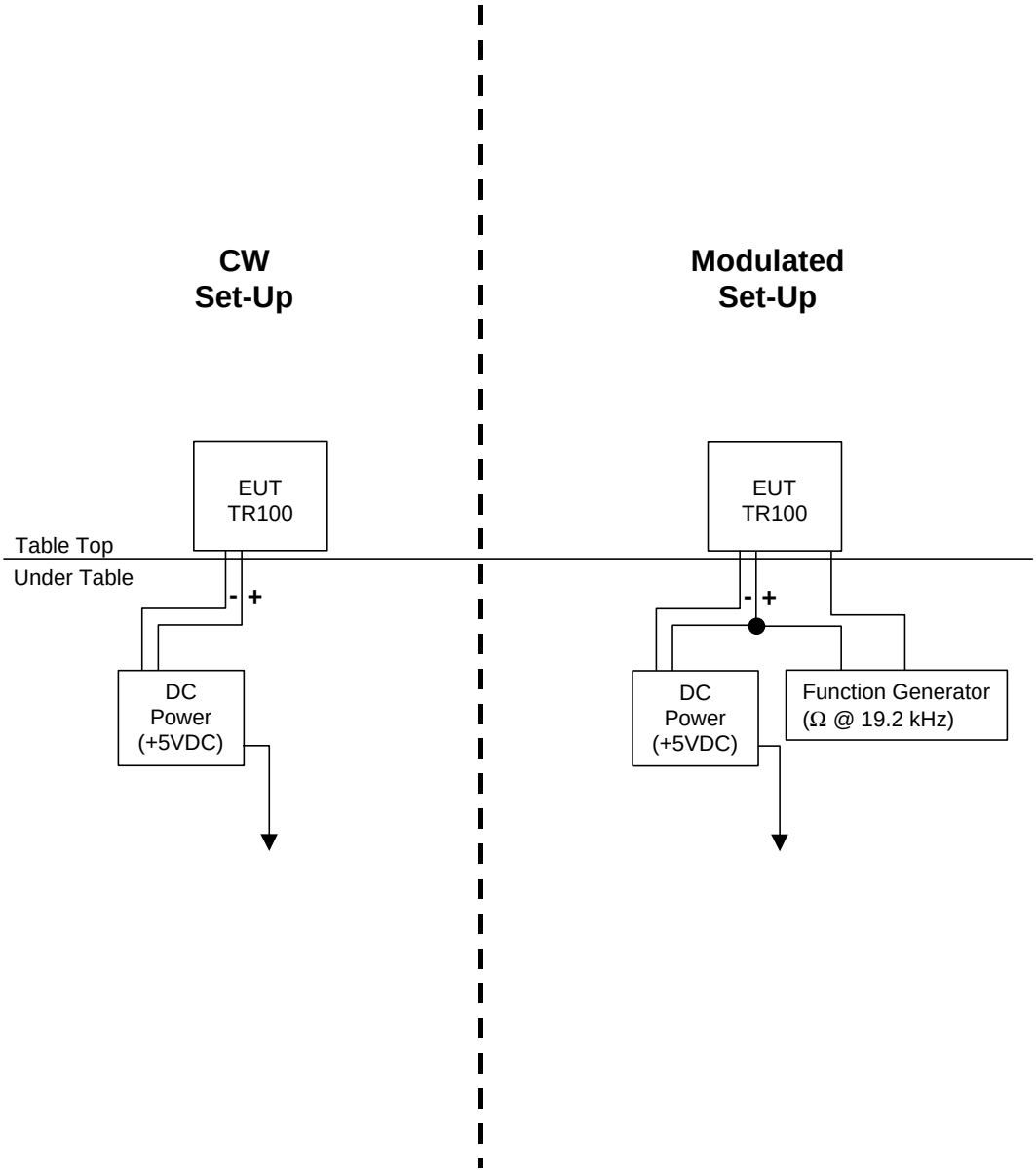
No special accessories are sold with the EUT.

2.4 Equipment Modifications

The following modifications were made in order to achieve EMI compliance:

- R1 changed to 22k ohms, and R21 changed to 7.5k ohms.

Figure 2.1: Configuration of Tested System



3.0 Conducted Emissions Data

3.1 The initial step in collecting conducted data is a spectrum analyzer, peak scan of the entire measurement range. All signals with less than 3 dB margin are then measured using a quasi-peak detector. Complete graphs and data sheets may be referenced on the following page. Minimum margins are listed below:

FCC Part 15 Class B Specification Limits (Peak data)

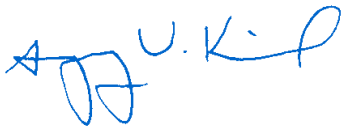
Frequency (MHz)	Measured Level (dBuV)	Limit (dBuV)	Margin (dB)*	Lead
22.914	29.8	48.0	18.2	High
27.370	29.8	48.0	18.2	High
14.653	29.8	48.0	18.2	High
13.508	29.7	48.0	18.3	High
14.533	29.6	48.0	18.4	High

Frequency (MHz)	Measured Level (dBuV)	Limit (dBuV)	Margin (dB)*	Lead
0.501	44.5	48.0	3.5	Low
0.518	41.2	48.0	6.8	Low
0.537	41.0	48.0	7.0	Low
0.513	40.6	48.0	7.4	Low
0.461	40.3	48.0	7.7	Low

Judgment: Passed, minimum margin of 3.5 dB.

All readings listed above are Peak, using an IF Bandwidth of 9 kHz, a video filter was not used.

Test Personnel:

Tester Signature:  Date: 02/25/00

Typed/Printed Name: Greg Kiemel

4.0 Radiated Emissions Data

4.1 The frequency spectrum was investigated up to 10 GHz. The following data lists the six most significant emission frequencies, total (corrected) levels, and specification margins. Correction factors, antenna height, table azimuth, etc., are contained in the data sheets immediately following. Explanation of the correction factors is given in paragraph 7.2 of this report. Complete graphs and data sheets may be referenced on the following pages. Minimum margins are listed below:

FCC Class B Specification Limits

Transmit Frequency– Wire Antenna

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization
916.641	Quasi-Peak	93.7	94.0	0.3	Horizontal
916.641	Quasi-Peak	87.3	94.0	6.7	Vertical

Judgment: Passed, minimum margin of 0.3 dB.

Transmit Frequency – Whip Antenna

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization
916.501	Quasi-Peak	88.9	94.0	5.1	Horizontal
916.500	Quasi-Peak	88.1	94.0	5.9	Vertical

Judgment: Passed, minimum margin of 5.1 dB.

4.1 Radiated Emissions Data (continued)

Harmonics – Whip Antenna

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization
35.340	PK	18.1	40.0	21.9	Vertical
77.966	PK	22.9	40.0	17.1	Vertical
82.933	PK	16.0	40.0	24.0	Vertical
84.653	PK	23.7	40.0	16.3	Vertical
1832.895	PK	53.4	74.0	20.6	Vertical
1832.895	PK	52.4	74.0	21.6	Horizontal
1832.895	AV	51.7	54.0	2.4	Vertical
1832.895	AV	50.2	54.0	3.9	Horizontal

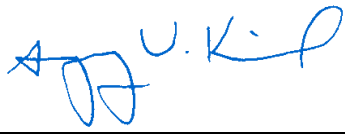
Judgment: Passed, minimum margin of 2.4 dB.

Harmonics – Wire Antenna

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization
1832.800	PK	54.2	57.0	19.8	Vertical
1832.800	AV	53.2	54.0	0.8	Vertical
1832.800	PK	51.7	74.0	22.3	Horizontal
1832.800	AV	50.0	54.0	4.0	Horizontal

Judgment: Passed, minimum margin of 0.8 dB.

Test Personnel:



Tester Signature:_____ Date: 02/25/00

Typed/Printed Name: Greg Kiemel

Tester Signature:_____ Date: 02/11/00

Typed/Printed Name: Rodney Peloquin

4.2 Field Strength Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured level. The basic equation with a sample calculation is as follows:
FS = RA + AF + CF - AG

where : FS = Field Strength

RA = Measured Level

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/meter.

FS = 52.5 + 7.4 + 1.1 - 29 = 32 dBuV/meter
Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20] = 39.8 uV/m

4.3 Measurement Bandwidths

Peak Data

150 kHz - 30 MHz.....10 kHz
30 MHz - 1000 MHz .....100 kHz
1000 MHz - 1000 MHz .....1000 kHz

Quasi-peak Data

150 kHz - 30 MHz.....9 kHz
30 MHz - 1000 MHz .....120 kHz

All radiated measurements are quasi-peak unless otherwise stated.
All conducted measurements are peak unless otherwise stated. A video filter was not used.

5.0 Measurement Equipment

Instrument	Manufacturer	Model	Serial No.	Cal Due
Spectrum Analyzer	Hewlett-Packard	8566B	2747A05213	1/19/01
Quasi-Peak Adapter	Hewlett-Packard	85650A	2811A01353	1/19/01
LISN	Solar	9252-50-R	961006	5/21/00
Antenna, Biconilog	EMCO	3141	9906-1146	6/15/00
Antenna, Dipole	EMCO	3121C	9906-1439	6/30/00
Antenna, Horn	EMCO	3115	9804-5441	7/10/00
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	621707	7/18/00

Appendix I: Measurement Procedures

Each frequency was measured in both the horizontal and vertical antenna polarizations.

The EUT position was maximized for each frequency, for both the horizontal and vertical antenna polarizations, using a remotely controlled turntable.

The antenna height was varied from 1 – 4 meters at each frequency, for both the horizontal and vertical positions to maximize the emission level.

The cable and peripheral positions were manipulated to ensure maximum levels at each frequency for both horizontal and vertical antenna polarizations.

All measurements are made at an antenna to EUT distance of 3 meters.