



CERTIFICATION TEST REPORT
FOR THE
RADAR INTRUSION DETECTION LINK,
24000 TRANSMITTER
FCC PART 15 SUBPART C
15.245
COMPLIANCE

DATE OF ISSUE: APRIL 21, 2000

PREPARED FOR:

Perimeter Products, Inc.
12628 Interurban Avenue South
Seattle, WA 98168

P.O. No: 12062

W.O. No: 73440

Report No: FC00-035

DOCUMENTATION CONTROL:

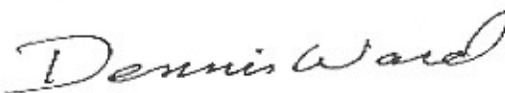

Tracy Phillips
Documentation Control Supervisor
CKC Laboratories, Inc.

PREPARED BY:

Joyce Walker
CKC Laboratories, Inc.
5473A Clouds Rest
Mariposa, CA 95338

Date of test: February 29 - March 10, 2000

APPROVED BY:


Dennis Ward
Director of Laboratories
CKC Laboratories, Inc.

This report contains a total of 25 pages and may be reproduced in full only. Partial reproduction may only be done with the written consent of CKC Laboratories, Inc.

Page 1 of 25
Report No: FC00-035

TABLE OF CONTENTS

Administrative Information	3
Summary Of Results	4
Equipment Under Test (EUT) Description	4
Measurement Uncertainty	4
EUT Operating Frequency	4
Peripheral Devices	4
Report Of Measurements	5
Table 1: Fundamental Emission Levels	5
Table 2: Six Highest Radiated Emission Levels - 9kHz-18GHz	6
Table 3: Six Highest Radiated Emission Levels - 18-100GHz	7
Table A : List Of Test Equipment	8
EUT Setup	9
Test Instrumentation And Analyzer Settings	9
Table B : Analyzer Bandwidth Settings Per Frequency Range	9
Spectrum Analyzer Detector Functions	10
Peak	10
Quasi-Peak	10
Average	10
Test Methods	11
Radiated Emissions Testing	11
Sample Calculations	12
Appendix A : Information About The Equipment Under Test	13
I/O Ports	14
Crystal Oscillators	14
Printed Circuit Boards	14
Cable Information	14
Required EUT Changes To Comply	14
Photograph Showing Radiated Emissions	15
Photograph Showing Radiated Emissions	16
Appendix B : Measurement Data Sheets	17
Band Edges	18

CKC Laboratories, Inc. has Certificates of Accreditation from the following agencies:
DA Tech (Germany); A2LA (USA); FCC (USA); VCCI (Japan); BSMI (Taiwan); HOKLAS (Hong Kong).
CKC Laboratories, Inc. has Letters of Acceptance through an MRA for the following agencies:
ACA/NATA (Australia); SABS (South Africa); SWEDAC (Sweden); TUV Rheinland-Germany; TUV Rheinland-Korea; TUV Rheinland-Russia; Radio Communications Agency (RA); NEMKO (Norway).

ADMINISTRATIVE INFORMATION

DATE OF TEST: February 29 - March 10, 2000

PURPOSE OF TEST: To demonstrate the compliance of the Radar Intrusion Detection Link, 24000 Transmitter, with the requirements for FCC Part 15 Subpart C 15.245 devices.

MANUFACTURER: Perimeter Products, Inc.
12628 Interurban Avenue South
Seattle, WA 98168

REPRESENTATIVE: John Kurlmel

TEST LOCATION: CKC Laboratories, Inc.
22105 Wilson River Hwy, Tillamook, OR 97141
5289 NE Elam Young Pkwy, Hillsboro, OR 97124

TEST PERSONNEL: Mike Wilkinson & Bill Baker

TEST METHOD: ANSI C63.4 1992

FREQUENCY RANGE TESTED: 9 kHz - 100 GHz

EQUIPMENT UNDER TEST:

Radar Intrusion Detection Link

Manuf: Perimeter Products, Inc.
Model: 24000 Transmitter
Serial: 5540-07
FCC ID: FL924000 (pending)

SUMMARY OF RESULTS

The Perimeter Products, Inc. Radar Intrusion Detection Link, 24000 Transmitter, was tested in accordance with ANSI C63.4 1992 for compliance with FCC Part 15 Subpart C 15.245.

As received, the above equipment was found to be fully compliant with the limits of FCC Part 15 Subpart C 15.245. The results in this report apply only to the items tested, as identified herein.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

24 GHz point field disturbance sensor.

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ± 4 dB measurement uncertainty.

EUT OPERATING FREQUENCY

The EUT was operating on channel A at 24097.830 - 24104.0 MHz and on channel F at 24098.330 - 24099.830 MHz.

TEMPERATURE AND HUMIDITY DURING TESTING

The temperature during testing was within $+15^{\circ}\text{C}$ and $+35^{\circ}\text{C}$.
The relative humidity was between 20% and 75%.

PERIPHERAL DEVICES

The EUT was not tested with peripheral devices.

REPORT OF MEASUREMENTS

The following tables report the highest worst case levels recorded during the tests performed on the Radar Intrusion Detection Link, 24000 Transmitter. All readings taken are peak readings unless otherwise noted by a "Q" or "A". The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: Fundamental Emission Levels

FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS				CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTES
		Horn dB	Amp dB	Cable dB	Dist dB				
24097.830	94.5	32.0	-40.7	13.5		99.3	128.0	-28.7	H Channel A
24098.330	96.0	32.0	-40.7	13.5		100.8	128.0	-27.2	H Channel F
24099.830	111.7	32.1	-40.7	13.5		116.6	128.0	-11.4	V Channel F
24104.000	112.0	32.1	-40.7	13.5		116.9	128.0	-11.1	V Channel A

Test Method: ANSI C63.4 1992
Spec Limit : FCC Part 15.245
Test Distance: 3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: EUT is powered by an external 12 V DC battery. Transmitting continuously with modulation on channel A (9521 Hz) or F (15981 Hz) as noted for each reading. The temperature was 19.5°C and the humidity was 58%.

Table 2: Six Highest Radiated Emission Levels - 9kHz-18GHz

FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS				CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
35.813	39.6	16.8	-27.6	1.2		30.0	40.0	-10.0	V
39.385	45.4	14.2	-27.6	1.4		33.4	40.0	-6.6	V
107.389	45.9	10.7	-27.3	2.2		31.5	43.5	-12.0	V
114.576	44.9	11.2	-27.3	2.4		31.2	43.5	-12.3	V
171.864	45.6	9.6	-27.0	3.0		31.2	43.5	-12.3	V
14615.740	32.7	40.9	-40.1	9.1		42.6	54.0	-11.4	V

Test Method: ANSI C63.4 1992
Spec Limit : FCC Part 15.245
Test Distance: 3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: EUT is powered by an external 12 V DC battery. Transmitting continuously with modulation on channel A (9521 Hz) or on channel F (15981 Hz). EUT is mounted on a vertical plastic post 80 cm off the ground plane using supplied hardware kit #10053-105-02. The temperature was 19.5°C and the humidity was 58%. Frequency range investigated was 9.0 kHz to 18.0 GHz.

Table 3: Six Highest Radiated Emission Levels - 18-100GHz

FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS				CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Mixer dB				
19017.670	45.5	29.9	-39.2	10.8		47.0	54.0	-7.0	VA
19017.670	45.5	29.9	-39.2	10.8		47.0	54.0	-7.0	VA
30000.000	44.5	35.1	-37.8	10.0		51.8	54.0	-2.2	VA
30000.000	44.5	35.1	-37.8	10.0		51.8	54.0	-2.2	VA
48146.660	26.3			1.5	29.5	57.3	88.0	-30.7	VA
72299.330	40.8			1.5	38.0	80.3	88.0	-7.7	VA

Test Method: ANSI C63.4 1992
Spec Limit : FCC Part 15.245
Test Distance: 3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: EUT is powered by an external 12 V DC battery. Transmitting continuously with modulation on channel A (9521 Hz) or on channel F (15981 Hz). EUT is mounted on a vertical plastic post 80 cm off the ground plane using supplied hardware kit #10053-105-02. The temperature was 19.5°C and the humidity was 58%. Frequency range investigated was 18.0 GHz to 100.0 GHz.

TABLE A
LIST OF TEST EQUIPMENT
Tillamook Site A and Hillsboro Lab

Function	S/N	Calibration Date	Cal Due Date	Asset #
HP8564E	3623A00539	12/07/1999	12/07/2000	1406
ARA MWH1826	1005	02/02/2000	02/02/2001	2046
HP 83051A	3332A00284	02/21/2000	02/21/2001	0
HP 8447D	2727A05392	02/14/2000	02/14/2001	10
Chase CBL6111C	2455	08/30/1999	08/30/2000	1992
HP 8574A	3010A01076	07/15/1999	07/15/2000	0
EMCO 6502	2156	01/26/2000	01/26/2001	52
EMCO 3115	9006-4854	02/17/2000	02/17/2001	1412
ARA MWH2640	4123	02/02/2000	02/02/2001	2045
M19HWA 40-60GHz Mixer	U91211-1	12/01/1999	12/01/2000	2347
M12HWA 60-90 GHz Mixer	E91211-1	12/12/1999	12/12/2000	2348
M08HWA 90-110 GHz Mixer	F91211-1	12/01/1999	12/01/2000	2349

EUT SETUP

The equipment under test (EUT) was set up in a manner that represented its normal use. Any special conditions required for the EUT to operate normally are identified in the comments that accompany Table 1 for fundamental radiated emissions, Tables 2 & 3 for radiated. Additionally, a complete description of all the ports and I/O cables is included on the information sheets contained in Appendix A.

During radiated emissions testing, the EUT was mounted on a vertical plastic post 80 cm off the ground plane using supplied hardware kit #10053-105-102.

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to collect the radiated emissions data for the Radar Intrusion Detection Link, 24000 Transmitter. For measurements below 30 MHz the mag loop antenna was used. For radiated measurements from 30 to 1000 MHz, the biconilog antenna was used. For frequencies above 1000 MHz, horn antennas and mixers were used. All antennas were located at a distance of 3 meters from the edge of the EUT.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB μ V, and a vertical scale of 10 dB per division.

TABLE B : ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE

TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	100 GHz	1 MHz

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Tables 1, 2 and 3 indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "Q" or an "A" in the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the Radar Intrusion Detection Link, 24000 Transmitter.

Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP Quasi-Peak Adapter for the HP Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

Average

When the frequencies exceed 1 GHz, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

TEST METHODS

The radiated emissions data of the Radar Intrusion Detection Link, 24000 Transmitter, was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the "Sample Calculations". The corrected data was then compared to the FCC Part 15, Subpart C 15.245 emissions limits to determine compliance.

Preliminary and final measurements were taken in order to better ensure that all emissions from the EUT were found and maximized.

Radiated Emissions Testing

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode. For frequencies below 30 MHz the mag loop antenna was used. The frequency range of 30 MHz - 1000 MHz was then scanned with the biconilog antenna located about 1.5 meter above the ground plane in the vertical polarity. During this scan, the turntable was rotated and all peaks, which were at or near the limit, were recorded. Lastly, a scan of the FM band from 88 - 110 MHz was made, using a reduced resolution bandwidth and a reduced frequency span. The biconilog antenna was changed to the horizontal polarity and the above steps were repeated. Horn antennas and mixers were used to scan for frequencies above 1000 MHz. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

For the final radiated scan, the equipment was again positioned facing the antenna. A thorough scan of all frequencies was manually made using a small frequency span, rotating the turntable as needed. Comparison with the previously recorded measurements was then made.

Using the peak readings from both scans as a guide, the test engineer then maximized the readings with respect to the table rotation and antenna. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

SAMPLE CALCULATIONS

The basic spectrum analyzer reading was converted using correction factors as shown in the emissions readings in Tables 1 - 3. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula:

$$\begin{aligned}
 &\text{Meter reading (dB}\mu\text{V)} \\
 &+ \text{Antenna Factor (dB)} \\
 &+ \text{Cable Loss (dB)} \\
 &- \text{Distance Correction (dB)} \\
 &- \text{Pre-amplifier Gain (dB)} \\
 &= \text{Corrected Reading (dB}\mu\text{V/m)}
 \end{aligned}$$

This reading was then compared to the applicable specification limit to determine compliance.

A typical data sheet will display the following in column format:

#	Freq MHz	Rdng dB μ V	Cable	Amp	Bilog	Horn	Mag	Dist	Corr dB μ V/m	Spec	Margin	Polar
	Mixer											

means reading number

Freq MHz is the frequency in MHz of the obtained reading.

Rdng dB μ V is the reading obtained on the spectrum analyzer in dB μ V.

Amp is short for the preamplifier factor or gain in dB.

Bilog is the biconilog antenna factor in dB.

Horn is the horn antenna factor in dB.

Cable is the cable loss in dB of the coaxial cable on the OATS.

Dist is the distance factor (in dB). It is used when testing at a different test distance than the one stated in the spec.

Corr dB μ V/m is the corrected reading which is now in dB μ V/m (field strength).

Spec is the specification limit (dB) stated in the agency's regulations.

Margin is the closeness to the specified limit in dB; + is over and - is under the limit.

Polar is the Polarity of the antenna with respect to earth.

Mag is the mag loop antenna factor in dB.

Mixer is the mixer and horn antenna factor in dB.