

## TABLE OF CONTENTS LIST

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-EHC

### TEST REPORT CONTAINING:

PAGE 1.....LETTER ABOUT CONFIDENTIALITY & PROFESSIONAL  
INSTALLATION  
PAGE 2.....LETTER OF EXPLANATION  
PAGE 3.....LIST OF TEST EQUIPMENT AND TEST PROCEDURE  
PAGE 4.....TEST PROCEDURE CONTD & BLOCK DIAGRAM OF  
TEST SET UP AND CIRCUIT DESCRIPTION  
PAGE 5.....15.247(a)(2) 6.0dB BANDWIDTH & POWER OUTPUT  
PAGE 6.....15.247(c) ANTENNA CONDUCTED SPURIOUS  
PAGE 7.....15.247(c) RADIATED SPURIOUS EMISSIONS  
PAGE 8.....METHOD OF MEASURING RADIATED SPURIOUS EMISSIONS  
PAGE 9.....15.247(d) POWER SPECTRAL DENSITY  
PAGE 10.....PROCESSING GAIN (FROM ATT)  
PAGE 11.....POWER LINE CONDUCTED SPURIOUS EMISSIONS

### EXHIBITS CONTAINING:

EXHIBIT 1A.....POWER OF ATTORNEY LETTER  
EXHIBIT 1B.....CONFIDENTIALITY LETTER  
EXHIBIT 2.....PERMISSION LETTER FROM AIRONET  
EXHIBIT 3A-B.....TEST SET UP PHOTOGRAPHS  
EXHIBIT 4.....FCC ID LABEL SAMPLE  
EXHIBIT 5.....FCC ID LABEL LOCATION  
EXHIBIT 6A.....EXTERNAL FRONT VIEW PHOTOGRAPH  
EXHIBIT 6B.....EXTERNAL REAR VIEW PHOTOGRAPH  
EXHIBIT 7A-7C.....BLOCK DIAGRAMS  
EXHIBIT 8.....USER'S MANUAL  
EXHIBIT 10A-B.....BANDWIDTH PLOTS  
EXHIBIT 11A-B.....SPECTRAL DENSITY PLOTS  
EXHIBIT 12A-B.....PLOTS OF POWER LINE CONDUCTED EMISSIONS  
EXHIBIT 13A-E.....PROCESSING GAIN INFORMATION

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-EHC

REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT

DATE: 15 Sept. 1999

TABLE OF CONTENTS LIST

15 Sept. 1999

Federal Communications Commission  
Authorization and Evaluation Division  
7435 Oakland Mills Road  
Columbia, MD 21046

SUBJECT: TELLUMAT (PTY) LIMITED.  
FCC ID: ONJMDR2400-EHC

To Whom It May Concern:

This will serve as a request for confidentiality for the schematics for the radio. The schematics will be sent directly from the manufacturer to the FCC upon request. Once the review of the application is complete and the schematics are no longer needed, they must be returned to the manufacturer, where they were sent from.

Should you have any questions or require any further information with regards to this, please feel free to contact me.

Sincerely,

S. S. Sanders

SSS/sh  
Encl.

APPLICANT: TELLUMAT (PTY) LIMITED.  
FCCID: ONJMDR2400-EHC  
REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT  
DATE: 15 Sept. 1999  
PAGE #: 1

15 Sept. 1999

Federal Communications Commission  
Authorization and Evaluation Division  
7435 Oakland Mills Road  
Columbia, MD 21046

SUBJECT: TELLUMAT (PTY) LIMITED.  
FCCID: ONJMDR2400-EHC

To Whom It May Concern:

Attached you will find an application for a direct sequence spread spectrum assembly that is intended to be professionally installed. This unit will only be installed by authorized dealers that have been trained at the manufacturer's facilities.

The model only operates on two(2) frequencies, 2.411GHz and 2.455GHz and only comes in two configurations;

1. Long pointed antenna
2. Parabolic Antenna.

The users manual will have the following statement in it;

"WARNING! ALL PERSONNEL SHOULD STAY AT LEAST 1 METER(3.5') FROM ANTENNA TO AVOID EXPOSURE TO POSSIBLE MICROWAVE ENERGY."

The antenna is intended to be used outside.

Sincerely,

S. S. Sanders

SSS/sh  
Encl.

APPLICANT: TELLUMAT (PTY) LIMITED.  
FCCID: ONJMDR2400-EHC  
REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT  
DATE: 15 Sept. 1999  
PAGE #: 2

#### TEST EQUIPMENT LIST

1. Spectrum Analyzer: Hewlett Packard 8566B - Opt 462, w/ preselector 85685A, & Quasi-Peak Adapter HP 85650A, & HP 8449B - OPT H02 Cal. 7/6/99
2. Signal Generator, Hewlett Packard 8640B, cal. 9/23/99
3. Signal Generator, HP 8614A Serial No.2015A07428 cal. 5/27/99
3. Eaton Biconical Antenna Model 94455-1  
20-200 MHz Serial No. 0997 Cal. 10/30/98
4. Electro-Metric Dipole Kit, 20-1000 MHz, Model TDA-30 10/31/98
5. Electro-Metric Horn 1-18 GHz, Model RGA-180, Cal. 4/27/99
6. Electro-Metric Antennas Model TDA-30/1-4, Cal. 10/15/98
7. Electro-Metric Line Impedance Stabilization Network Model No. EM-7821, Serial No. 101; 100KHz-30MHz 50uH. Cal.11/19/98
8. Electro-Metric Line Impedance Stabilization Network Model No. EM-7820, Serial No. 2682; 10KHz-30MHz 50uH. Cal. 11/19/98
9. Special low loss cable was used above 1 GHz
10. Tenney Temperature Chamber
11. AC Voltmeter, HP 400FL, Serial No 2213A14499. Cal. 9/21/99
12. Digital Multimeter, Fluke 8010A/12A, Serial No. 4810047. Cal 9/21/99
13. Digital Multimeter, Fluke 77, Serial No. 43850817. Cal 9/21/99
14. Oscilloscope, Tektronix 2230, Serial No. 300572. Cal 9/23/99
15. Frequency Counter, HP 5385A, Serial No. 3242A07460. Cal 10/6/99

#### TEST PROCEDURE

GENERAL: This report shall NOT be reproduced except in full without the written approval of TIMCO ENGINEERING, INC. Shielded interface cables were used in all cases except for cables connecting to the telephone line and the power cords. A test program was run which simulated a normal data transmission on a network.

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-1992 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The ambient temperature of the UUT was 76oF with a humidity of 55%.

BANDWIDTH 6.0dB: The measurements were made with the spectrum analyzer's resolution bandwidth(RBW)=100KHz and the video bandwidth(VBW) =300KHz and the span set as shown on plot.

POWER OUTPUT: The RF power output was measured at the antenna feed point using a peak power meter.

APPLICANT: TELLUMAT (PTY) LIMITED.

FCCID: ONJMDR2400-EHC

REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT

DATE: 15 Sept. 1999

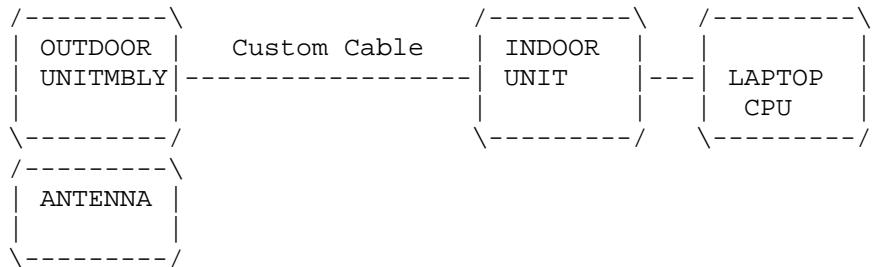
PAGE #: 3

## TEST PROCEDURE CONTINUED

ANTENNA CONDUCTED EMISSIONS: The RBW=100KHz, VBW=300KHz and the span set to 100MHz and the spectrum was scanned from 30MHz to the 10th Harmonic of the fundamental.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-1992 using a HEWLETT PACKARD spectrum analyzer with a pre-selector. The bandwidth(RBW) of the spectrum analyzer was 100kHz up to 1GHz and 1.0MHz above 1GHz with an appropriate sweep speed. The VBW above 1.0GHz was = 10Hz. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the UUT was 82oF with a humidity of 63%.

## BLOCK DIAGRAM OF TEST SET UP



## CIRCUIT DESCRIPTION:

The ONJMDR2400-EHC is a combination of the indoor unit the custom cable that connects the indoor unit to the outdoor unit, the outdoor unit and the antenna.

APPLICANT: TELLUMAT (PTY) LIMITED.

FCCID: ONJMDR2400-EHC

REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT

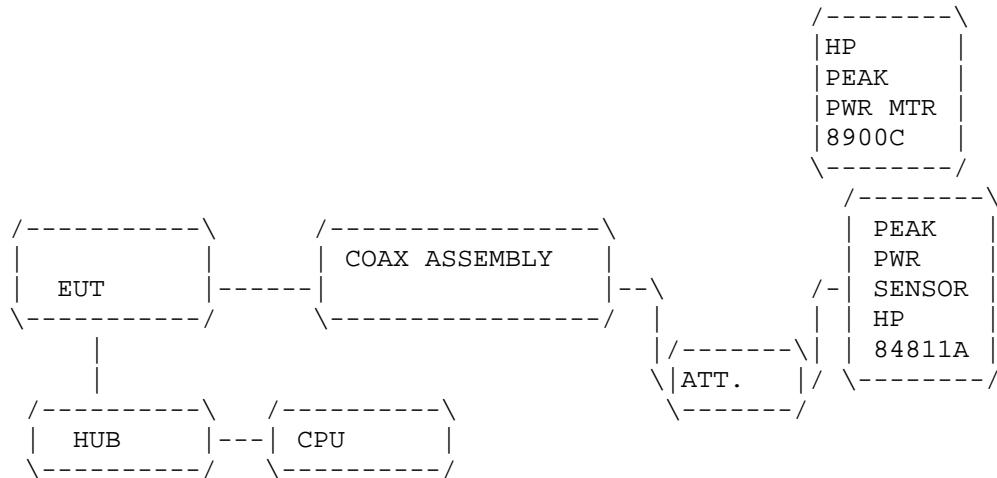
DATE: 15 Sept. 1999

PAGE #: 4

APPLICANT: TELLUMAT (PTY) LIMITED.  
FCC ID: ONJMDR2400-EHC  
NAME OF TEST: 6.0dB BANDWIDTH  
RULES PART NUMBER: 15.247(a)(2)  
REQUIREMENTS: The 6.0dB bandwidth must be greater than 500KHz.  
MEASUREMENT: The 6.0dB bandwidth measured 12.2 MHz.  
MEASUREMENT DATA: See plot on the next page.

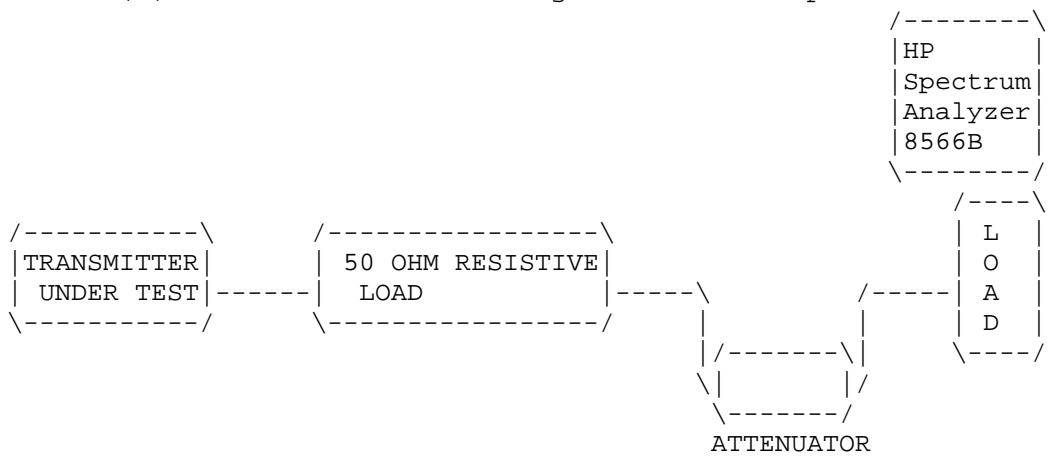
NAME OF TEST: POWER OUTPUT  
RULES PART NUMBER: 15.247(b)  
MEASUREMENT: 400 mWATTS or dBm

15.247(c) Method of Measuring RF Power output:  
The Peak power Sensor was connected in place of the antenna. Each configuration was tested with the coax cable length as described.



APPLICANT: TELLUMAT (PTY) LIMITED.  
FCCID: ONJMDR2400-EHC  
REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT  
DATE: 15 Sept. 1999  
PAGE #: 5

15.247(c) Method of Measuring RF Conducted Spurious Emissions



NAME OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

REQUIREMENTS: Emissions must be at least 20dB down from the highest emission level within the authorized band as measured with a 100KHz RBW.

	EMISSION FREQUENCY ____MHz____	dB BELOW CARRIER
<b>LOW FREQUENCY</b>		
Fundamental	2412.35	00.0
	4824.7	-33.0
	7237.1	-52.4
	9649.4	-63.4
	12061.8	-74.5
Fundamental	2430.0	00.0
	4860.0	-34.2
	7290.1	-51.7
	9720.0	-62.5
	12150.2	-72.5
<b>HIGH FREQUENCY</b>		
Fundamental	2454.3	00.0
	4908.5	-31.9
	7362.8	-60.5
	9817.0	-69.7
	12,271.6	-78.2
Fundamental	2472.3	00.0
	4944.5	-32.8
	7416.7	-61.3
	9889.0	-68.5
	12,361.2	-79.1

NOTE: THE SPECTRUM WAS SCANNED TO THE TENTH HARMONIC.

FCCID: ONJMDR2400-EHC  
 REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT  
 DATE: 15 Sept. 1999  
 PAGE #: 6

15.247(c) &15.109(b) Field\_strength\_of\_spurious\_emissions:

REQUIREMENTS: Emissions that fall in the restricted bands (15.205) must be less than 54dBuV/m otherwise the spurious and harmonics must be attenuated by at least 20dB.

TEST DATA:

EMISSION FREQUENCY MHz	METER READING @ 3m dBuV	COAX LOSS dB	ACF dB	FIELD STRENGTH dBuV/m	ATT. BELOW FUND. dB	MARGIN BELOW LIMIT dB	ANT.
2412.50	83.50	1.09	29.03	113.62	0.0		
4824.40R	17.10	1.45	33.93	52.48	61.14	1.52	V
7336.90R	10.10	1.83	36.75	48.69	64.93	5.31	V
2430.20	83.90	1.09	29.08	114.07	0.0		
4860.30R	17.00	1.46	33.97	52.43	61.64	1.57	V
7290.10R	10.00	1.82	36.70	48.53	65.54	5.47	V
2453.95	72.40	1.10	29.13	102.63	0.0		
4907.95R	18.90	1.47	34.02	51.45	51.18	2.55	V
7362.80R	9.1	1.83	36.75	47.68	54.95	6.32	V
2472.30	71.80	1.10	29.18	102.08	0.0		
4944.70R	17.70	1.47	34.06	53.23	47.85	0.77	V
7416.80R	9.90	1.84	36.84	48.59	53.49	5.41	V

METHOD OF MEASUREMENT: The procedure used was ANSI STANDARD C63.4-1992 except the spread spectrum portion was connected to its custom antenna at a height of 1.5 meters. The spectrum was scanned from 30MHz to at least the tenth harmonic of the fundamental. Above 1.0GHz the RBW was 1.0MHz and the VBW was 10Hz. The case was opened and the power removed from the radio in order to determine which emissions were digital. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 6051 N.W. 19th LANE, GAINESVILLE, FL 32605.

APPLICANT: TELLUMAT (PTY) LIMITED.

FCCID: ONJMDR2400-EHC

REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT

DATE: 15 Sept. 1999

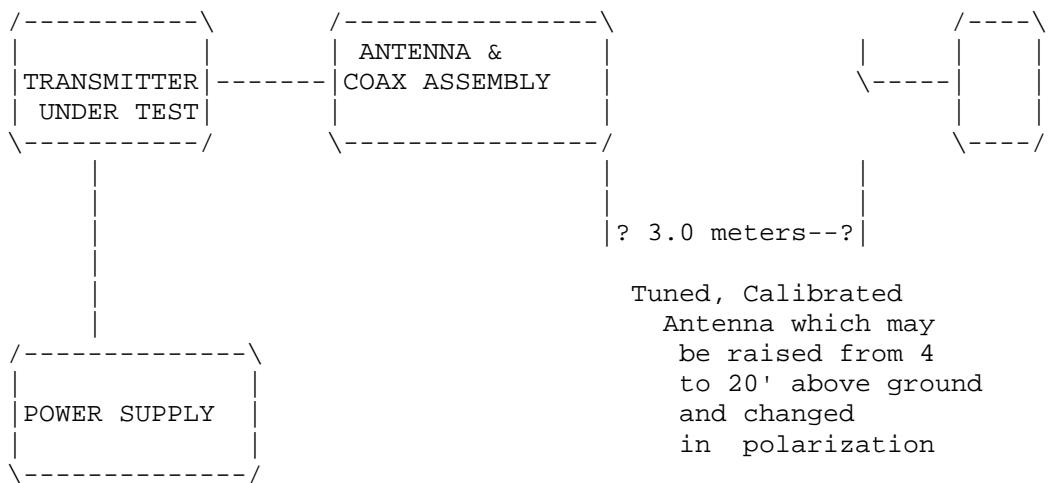
PAGE #: 7

2.993(a)(b)

2.993(a)(b) Continued Field\_strenght\_of\_spurious\_emissions:

Method of Measuring Radiated Spurious Emissions

Hewlett Packard  
Spectrum  
Analyzer  
HP8566A



Equipment placed 4' above ground  
on a rotatable platform.

APPLICANT: TELLUMAT (PTY) LIMITED.

FCCID: ONJMDR2400-EHC

REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT

DATE: 15 Sept. 1999

PAGE #: 8

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-EHC

NAME OF TEST: POWER SPECTRAL DENSITY

RULES PART NUMBER: 15.247(d)

REQUIREMENTS: The peak level measured must be no greater than -3.0dBm.

DATA: THE PLOT IN EXHIBIT 11 SHOWS A PEAK LEVEL OF -53.0 dBm PLUS THE ATTENUATOR OF 56dB GIVES A LEVEL OF +3.0dBm.

APPLICANT: TELLUMAT (PTY) LIMITED.

FCCID: ONJMDR2400-EHC

REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT

DATE: 15 Sept. 1999

PAGE #: 9

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-EHC

NAME OF TEST: PROCESSING GAIN

RULES PART NUMBER: 15.247(e)

REQUIREMENTS:

The configuration in this application use the Aironet radio FCC ID: LOZ025-1A as it was originally approved and with the same processing gain.

APPLICANT: TELLUMAT (PTY) LIMITED.

FCCID: ONJMDR2400-EHC

REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT

DATE: 15 Sept. 1999

PAGE #: 10

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-EHC - ASSEMBLY #1 AND #3

NAME OF TEST: POWER LINE CONDUCTED INTERFERENCE

RULES PART NUMBER: 15.107(a) - Class B Computing Device

REQUIREMENTS: .45 - 30 MHz 250 uV OR 47.96 dBuV

TEST PROCEDURE: ANSI STANDARD C63.4-1992. The spectrum was scanned from .45 to 30 MHz.

TEST DATA:

THE HIGHEST EMISSION READ FOR LINE 1 WAS 101.1uV @ 750KHz.

THE HIGHEST EMISSION READ FOR LINE 2 WAS 108.3uV @ 750KHz.

THE GRAPHS IN EXHIBITS 12A-12B REPRESENT THE EMISSIONS TAKEN FOR THIS DEVICE.

TEST RESULTS: Both lines were observed. The measurements indicate that the unit DOES appear to meet the FCC requirements for this class of equipment.

PERFORMED BY: \_\_\_\_\_ DATE: 15 Sept. 1999

APPLICANT: TELLUMAT (PTY) LIMITED.  
FCCID: ONJMDR2400-EHC  
REPORT #: T:\CUS\T\TELLUMAT\291ZA9\TEL291A9.RPT  
DATE: 15 Sept. 1999  
PAGE #: 11