

TABLE OF CONTENTS LIST

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-THC

TEST REPORT CONTAINING:

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

EXHIBITS CONTAINING:

EXHIBIT 1A.....POWER OF ATTORNEY LETTER
EXHIBIT 1B.....CONFIDENTIALITY LETTER
EXHIBIT 2.....PERMISSION LETTER FROM AERONAUT
EXHIBIT 3A-3B.....RADIATED EMISSIONS TEST SET UP PHOTOGRAPHS
EXHIBIT 3C-3D.....POWERLINE CONDUCTED 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 6C.....INTERNAL CHASSIS VIEW - COMPONENT SIDE
EXHIBIT 6D-6E.....INTERNAL CHASSIS VIEW - BOARDS COVERED
EXHIBIT 6F.....INTERNAL COMPONENT SIDE PHOTO
EXHIBIT 6G.....INTERNAL SOLDER SIDE PHOTO
EXHIBIT 6H.....INTERNAL COMPONENT SIDE PHOTO - SMALL BOARD
EXHIBIT 7A-7C.....BLOCK DIAGRAMS
EXHIBIT 8A-8E.....PROCESSING GAIN
EXHIBIT 9.....USER'S MANUAL
EXHIBIT 10.....THEORY OF OPERATION
EXHIBIT 11A-C.....BANDWIDTH PLOTS
EXHIBIT 12A-C.....SPECTRAL DENSITY PLOTS
EXHIBIT 13A-B.....PLOTS OF POWER LINE CONDUCTED EMISSIONS

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-THC

REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT

DATE: NOVEMBER 15, 1999

TABLE OF CONTENTS LIST

NOVEMBER 15, 1999

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

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

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.

Attached as Exhibit 1B you will find a request for approval as a professionally installed equipment.

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-THC
REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT
DATE: NOVEMBER 15, 1999
PAGE #: 1

TEST EQUIPMENT LIST

1. Spectrum Analyzer: HP 8566B-Opt 462, S/N 3138A07786, w/ preselector HP 85685A, S/N 3221A01400, Quasi-Peak Adapter HP 85650A, S/N 3303A01690 & Preamplifier HP 8449B-OPT H02, S/N 3008A00372 Cal. 10/17/99
2. Signal Generator: HP 8640B, S/N 2308A21464 Cal. 9/23/99
3. Signal Generator: HP 8614A, S/N 2015A07428 Cal. 5/29/99
4. Passive Loop Antenna: EMC Model 6512, 9KHz to 30MHz, S/N 9706-1211 Cal. 6/23/97
5. Biconnical Antenna: Eaton Model 94455-1, S/N 1057
6. Log-Periodic Antenna: Electro-Metrics Model EM-6950, S/N 632
7. Dipole Antenna Kit: Electro-Metrics Model TDA-30/1-4, S/N 153 Cal. 11/24/99
8. Double-Ridged Horn Antenna: Electro-Metrics Model RGA-180, 1-18 GHz, S/N 2319 Cal. 4/27/99
9. Horn 40-60GHz: ATM Part #19-443-6R
10. Line Impedance Stabilization Network: Electro-Metrics Model FCC-25/2, S/N 2512 Cal. 11/18/99
11. Line Impedance Stabilization Network: Electro-Metrics Model ANS-25/2, S/N 2604 Cal. 11/30/99
12. Line Impedance Stabilization Network: Electro-Metrics Model EM-7820, S/N 2682 Cal. 12/1/99
13. Line Impedance Stabilization Network: Electro-Metrics Model EM-7821, S/N 101 Cal. 12/1/99
14. Temperature Chamber: Tenney Engineering Model TTRC, S/N 11717-7
15. AC Voltmeter: HP Model 400FL, S/N 2213A14499 Cal. 9/21/99
16. Digital Multimeter: Fluke Model 8012A, S/N 4810047 Cal 9/21/99
17. Digital Multimeter: Fluke Model 77, S/N 43850817 Cal 9/21/99
18. Oscilloscope: Tektronix Model 2230, S/N 300572 Cal 9/23/99
19. Frequency Counter: HP Model 5385A, S/N 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%.

APPLICANT: TELLUMAT (PTY) LIMITED.

FCCID: ONJMDR2400-THC

REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT

DATE: NOVEMBER 15, 1999

PAGE #: 2

TEST PROCEDURE CONTINUED

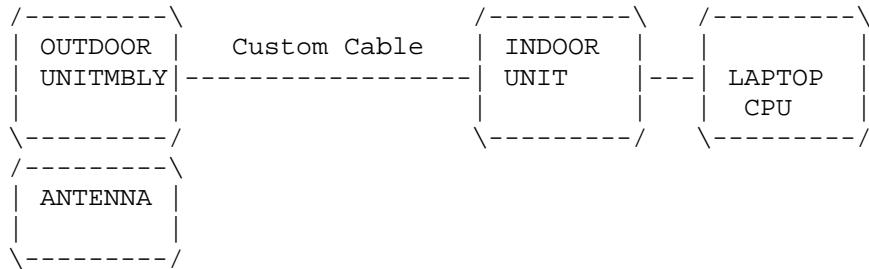
BANDWIDTH 6.0dB: The measurements were made with the spectrum analyzer's resolution bandwidth(RBW)=1.0MHz and the video bandwidth(VBW) =3.0MHz and the span set as shown on plot.

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

ANTENNA CONDUCTED EMISSIONS: The RBW=1.0MHz, VBW=3.0MHz 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 = 3.0MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the UUT was 57.3oF with a humidity of 44%.

BLOCK DIAGRAM OF TEST SET UP



CIRCUIT DESCRIPTION:

The ONJMDR2400-THC is a combination of the indoor unit the custom cable that connects the indoor unit to the outdoor unit, the outdoor unit and the custom antenna with 18dBi gain.

APPLICANT: TELLUMAT (PTY) LIMITED.

FCCID: ONJMDR2400-THC

REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT

DATE: NOVEMBER 15, 1999

PAGE #: 3

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-THC

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 9.1 MHz.

MEASUREMENT DATA: See plot on the next page.

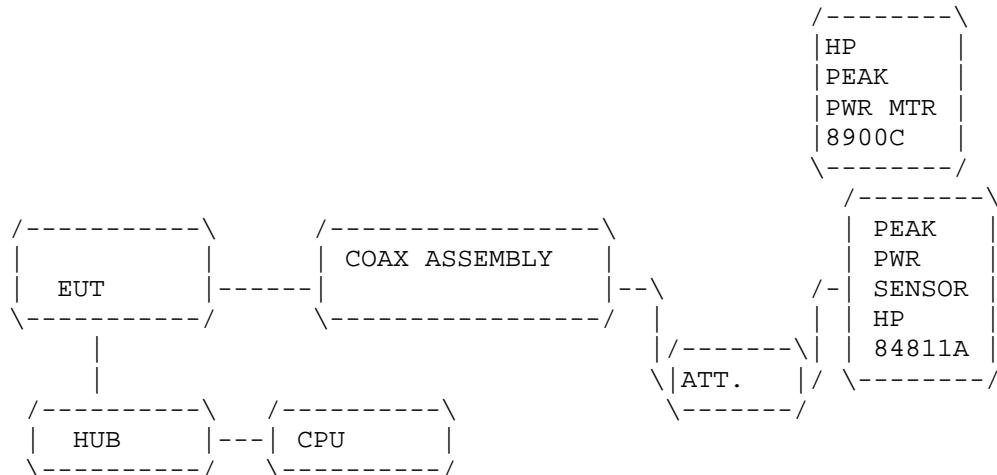
NAME OF TEST: POWER OUTPUT

RULES PART NUMBER: 15.247(b) The limit is 1.0W or +30dBm. For systems operating in the 2400-2483.5MHz with directional gain of greater than 6dBi the power limit is reduced 1dB for every 3dB over the 6dBi. In this case the limit is +26dBm or 400mW.

MEASUREMENT: 330 mWATTS or +25dBm

ANTENNA GAIN: 18dBi Therefore the Po limit is +26dBm

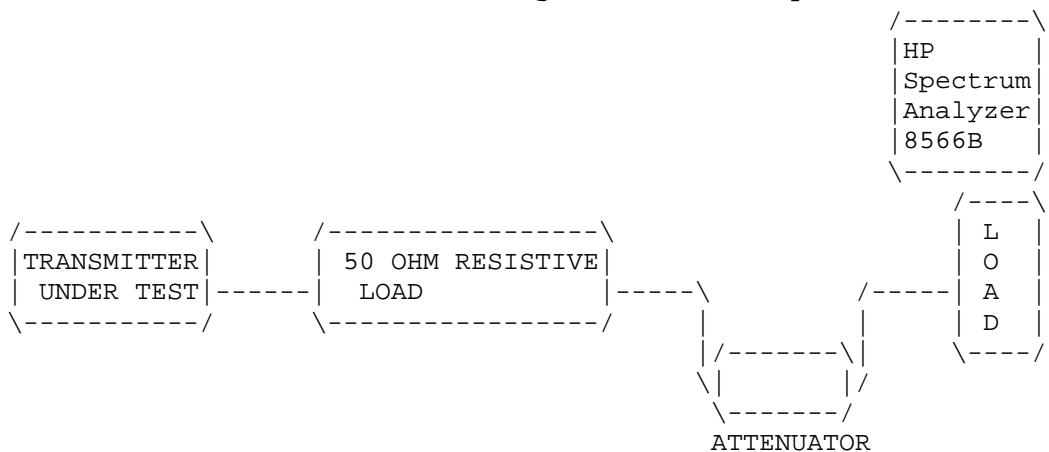
15.247(c) Method of Measuring RF Power output:
The Peak power Sensor was connected in place of the antenna. Each configuration was tested with the coax cable length as described.



APPLICANT: TELLUMAT (PTY) LIMITED.
FCCID: ONJMDR2400-THC
REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT
DATE: NOVEMBER 15, 1999
PAGE #: 4

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
LOW FREQUENCY		
Fundamental	2416.0	00.0
	4835.0	-55.5
	7251.0	-61.8
	9649.4	-68.5
Fundamental	2430.0	00.0
	4860.0	-64.9
	7290.1	-69.2
	9720.0	-72.1
HIGH FREQUENCY		
Fundamental	2455.5	00.0
	4908.0	-68.8
	7362.8	-70.1
	9817.0	-74.3

NOTE: THE SPECTRUM WAS SCANNED TO THE TENTH HARMONIC.

APPLICANT: TELLUMAT (PTY) LIMITED.

FCCID: ONJMDR2400-THC

REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT

DATE: NOVEMBER 15, 1999

PAGE #: 5

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	FCC LIMIT dB	MARGIN BELOW LIMIT dB	ANT.
2416.00	84.30	1.09	29.04	114.43	123.40	8.97	V
4846.00R	16.90	1.46	33.95	52.31	54.00	1.69	V
2430.90	82.40	1.09	29.08	112.57	123.40	10.83	V
4860.00R	15.20	1.46	33.97	50.63	54.00	3.37	V
2455.50	81.40	1.10	29.14	111.64	123.40	11.76	V
2483.50R	16.00	1.10	29.21	46.31	54.00	7.69	V
4911.00R	18.90	1.47	34.02	51.45	54.00	2.55	V

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-1992 & Guidance on Measurements of Direct Sequence Spread Spectrum. For measurements of emissions other than the fundamental the measurements were made at 1 meter and then moved back to 3 meters of calculated for 3 meters. 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 = 3.0MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the UUT was 57.3oF with a humidity of 44%.

Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 6051 N.W. 19th LANE, GAINESVILLE, FL 32605.

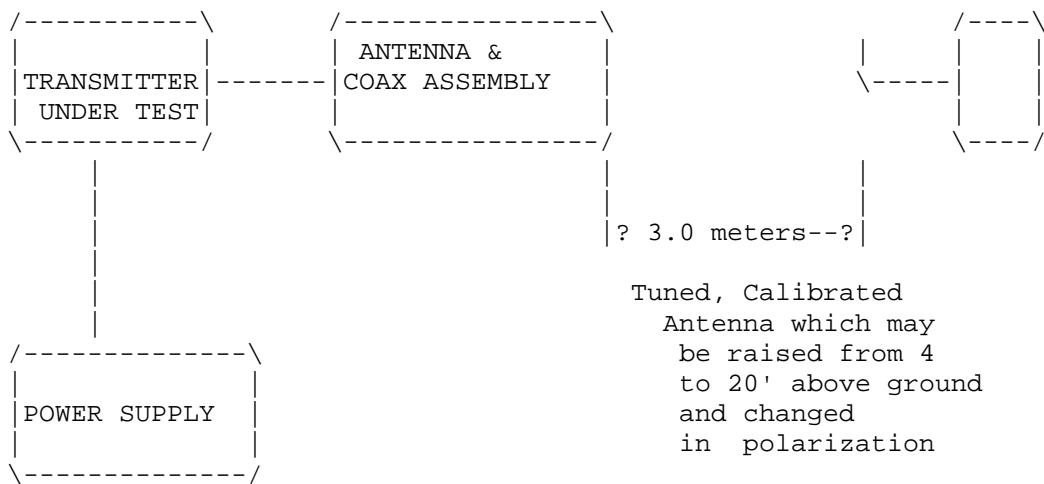
APPLICANT: TELLUMAT (PTY) LIMITED.
FCCID: ONJMDR2400-THC
REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT
DATE: NOVEMBER 15, 1999
PAGE #: 6

2.993(a)(b)

2.993(a)(b) Continued Field strength 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-THC
REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT
DATE: NOVEMBER 15, 1999
PAGE #: 7

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-THC

NAME OF TEST: POWER SPECTRAL DENSITY

RULES PART NUMBER: 15.247(d)

REQUIREMENTS: The peak level measured must be no greater than +8.0dBm.

DATA: THE PLOT ON THE FOLLOWING PAGE SHOWS A PEAK LEVEL OF PLUS THE ATTENUATOR OF 70dB GIVES A LEVEL AS follows;

2410.29MHz of -57.30dBm + 66dB = 6.7dBm
2429.40MHz of -64.50dBm + 66dB = 1.5dBm
2455.678MHz of -59.30dBm + 66dB = 6.7dBm

APPLICANT: TELLUMAT (PTY) LIMITED.
FCCID: ONJMDR2400-THC
REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT
DATE: NOVEMBER 15, 1999
PAGE #: 8

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-THC

NAME OF TEST: PROCESSING GAIN

RULES PART NUMBER: 15.247(e)

REQUIREMENTS: 10dB minimum

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

According to the radio maker the minimum processing gain is 13.4dB.

APPLICANT: TELLUMAT (PTY) LIMITED.

FCCID: ONJMDR2400-THC

REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT

DATE: NOVEMBER 15, 1999

PAGE #: 9

APPLICANT: TELLUMAT (PTY) LIMITED.

FCC ID: ONJMDR2400-THC - 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 89.017uV @ 690KHz.

THE HIGHEST EMISSION READ FOR LINE 2 WAS 76.64uV @ 8.49MHz.

THE FOLLOWING GRAPHS 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: NOVEMBER 15, 1999

APPLICANT: TELLUMAT (PTY) LIMITED.
FCCID: ONJMDR2400-THC
REPORT #: T:\CUS\T\TELLUMAT\TEL464U9\TEL464A9.RPT
DATE: NOVEMBER 15, 1999
PAGE #: 10

