

# TIMCO ENGINEERING INC.

849 NW State Road 45  
Newberry, Florida 32669  
<http://www.timcoengr.com>  
888.472.2424 F 352.472.2030 email: [sid@timcoengr.com](mailto:sid@timcoengr.com)



## Test Report

Product Name: HAND HELD MARINE TRANSCEIVER

FCC ID: KLLTM-886

Applicant:

TEKCOM INDUSTRIES LTD.  
BLOCK C, 9/F., KAISER ESTATE, PHASE 1  
41 MAN YUE STREET  
HUNG HOM, KOWLOON FO TAN, N.T. HONG KONG

Date Receipt: 7/14/2005

Date Tested: 8/4/2005

APPLICANT: TEKCOM INDUSTRIES LTD.  
FCC ID: KLLTM-886  
REPORT #: T\TEKCOM\_KLL\1484AUT5\1484AUT5TestReport.doc

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### EXHIBITS INCLUDING:

BLOCK DIAGRAM
SCHEMATIC
PARTS LIST
USERS MANUAL
LABEL SAMPLE
LABEL LOCATION
EXTERNAL PHOTOGRAPHS
INTERNAL PHOTOGRAPHS
OPERATIONAL DESCRIPTION
TUNING PROCEDURE
TEST SET UP PHOTOGRAPHS

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## GENERAL INFORMATION

2.1033(c) TEKCOM INDUSTRIES LTD. will sell the FCC ID:  
KLLTM-886 VHF  
Marine transmitter in quantity, for use under FCC  
RULES PART 80.

2.1033(c) TECHNICAL DESCRIPTION

(4) Type of Emission: 12K0G3E/12K0F3E

Bn = 2M + 2DK  
M = 3000  
D = 3.0KHz (Peak Deviation)  
K = 1  
Bn = 2(3.0K) + 2(3.0K)(1) = 6.0K + 6.0K = 12.0K

80.205 (a) ALLOWED AUTHORIZED BANDWIDTH = 20.00KHz.

2.1033(c)(6) Frequency Range: 156.025 - 157.950 MHz

2.1033(c)(7) Power Range and Controls: There is a user Power switch for High/Low Power. Maximum Output Power Rating: High 5 Watts, Low 1 Watt into a 50 ohm resistive load.

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2.1033(c)(8) DC Voltages and Current into Final Amplifier:

POWER INPUT	
FINAL AMPLIFIER ONLY	
High	Low
Vce = 7.2 Volts	Vce = 7.2 VDC
Ice = 1.82 A	Ice = 0.82
Pin = 13.10 Watts	Pin = 5.90 Watts

Function of each electron tube or semiconductor device or other active circuit device is included in the parts list exhibit.

2.1033(c)(9) Complete Circuit Diagrams: The circuit diagrams and block diagrams are included.

2.1033(c)(10) Instruction book. The instruction manual is included.

2.1033(c)(11) Tune-up procedure. The tune-up procedure is included.

Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description

2.1033(c)(11) Digital modulation. This unit does NOT use digital modulation.

The data required by 2.1046 through 2.1055 is submitted below.

## TECHNICAL DATA:

80.203 (b)

**External Controls:** The transmitter is capable of changing frequency between 156.05 - 157.950 MHz by external control. The available channels are shown in the User Manual description Channel List. These channels are preprogrammed by the manufacturer and change of frequency is inaccessible to the station operator.

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2.1046(a)

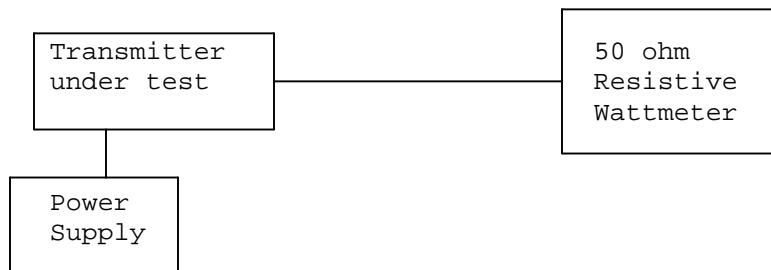
## RF power output.

80.215 (e)(1)

RF power is measured by connecting a 50 ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

OUTPUT POWER: HIGH: 5 W RADIATED  
LOW: 1 W RADIATED

## METHOD OF MEASURING RF POWER OUTPUT



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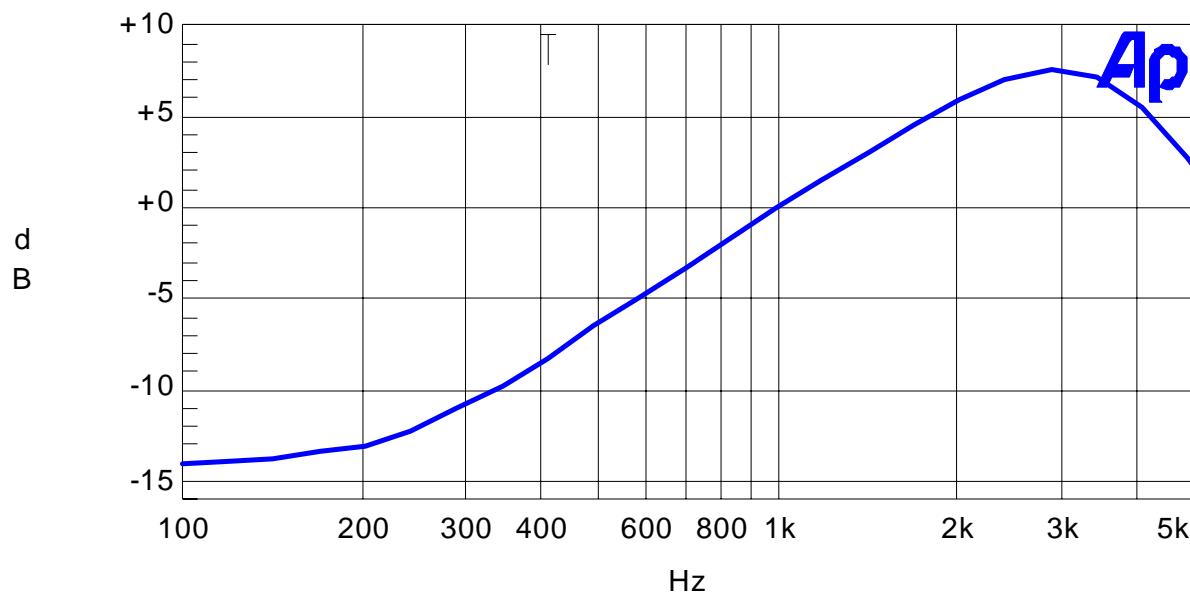
2.1047(a)

Voice Modulation characteristics:

(b)

AUDIO\_FREQUENCY\_RESPONSE See the following plot.

## Audio Frequency Response



Color	Line Style	Thick	Data	Axis
Blue	Solid	2	AnIr.Level A!Normalize	Left

MaxFreq.at1

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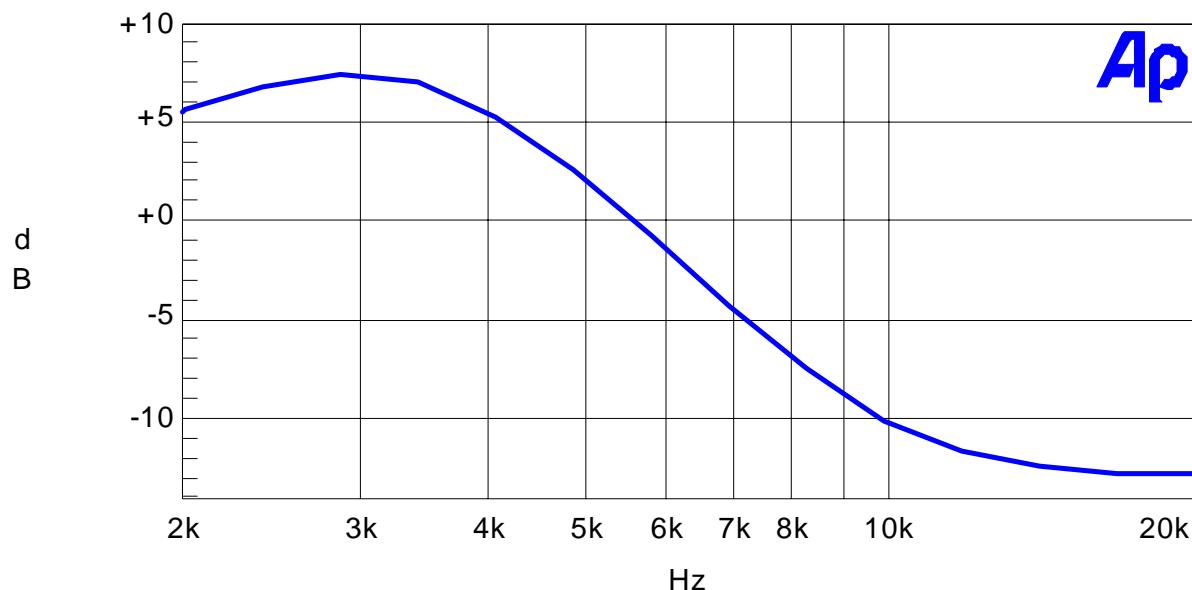
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2.1047(a)

## AUDIO\_LOW\_PASS\_FILTER

The audio low pass filter shown in the following plot.

### Audio Low Pass Filter



Color	Line Style	Thick	Data	Axis
Blue	Solid	2	Anlr.Level A!Normalize	Left

MaxFreq.at1

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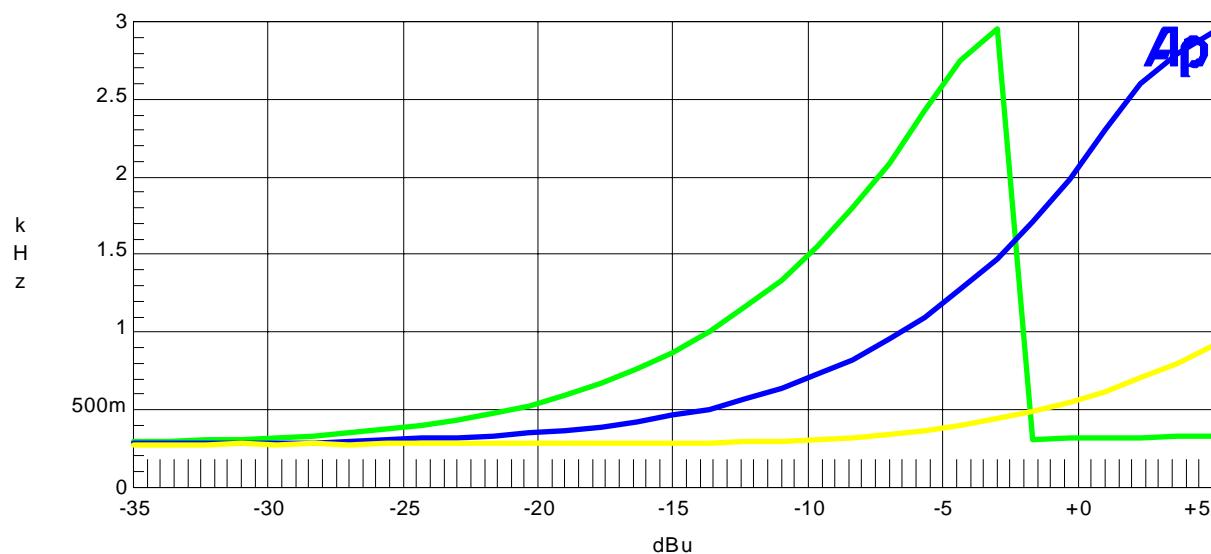
2.1047(b)

80.213 (d)

## Audio\_input\_versus\_modulation

A plot of the audio input versus deviation is shown in the following plots.

Modulation Limiting Plots:  
2.5 KHz (Green), 1.0 KHz (Blue), and 300 Hz (Yellow)



Color	Line Style	Thick	Data	Axis
Green	Solid	3	AnIr.Level A	Left
Blue	Solid	3	AnIr.Level A	Left
Yellow	Solid	3	AnIr.Level A	Left

modulation limiting.at1

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2.1049(c)

## Occupied bandwidth:

80.241

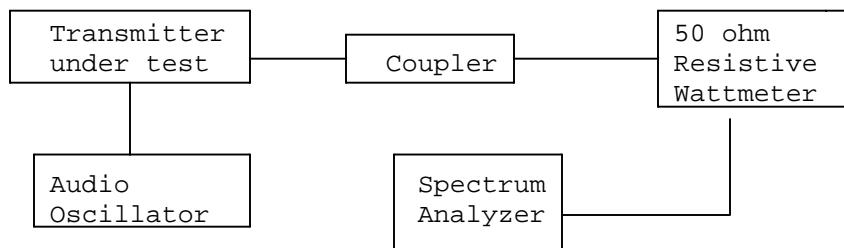
Data in the plots shows that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35dB. On any frequency removed from the assigned frequency by more than 250%, of the authorized bandwidth:  
At least  $43 + \log(P)$ dB.

## **Radiotelephone transmitter with modulation limiter.**

Test procedure: TIA/EIA-603 para 2.2.11, with the exception that various tones were used.

Test procedure diagram

### OCCUPIED BANDWIDTH MEASUREMENT



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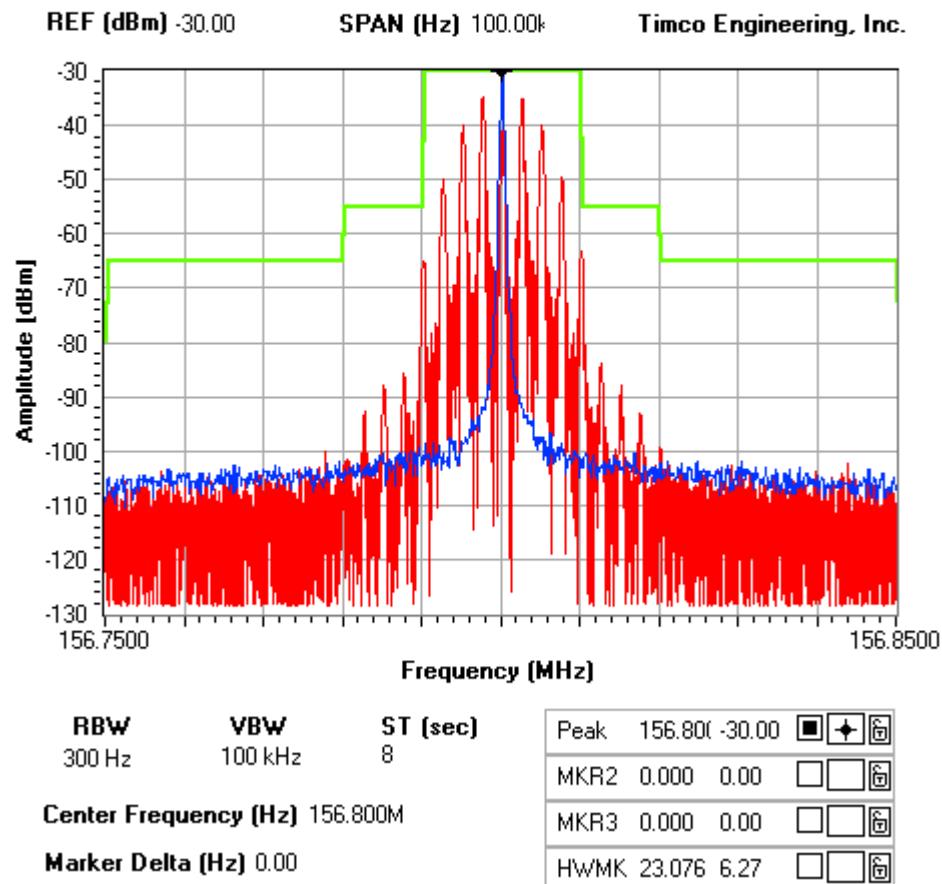
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## OCCUPIED BANDWIDTH PLOT

### NOTES:

TEKCOM INDUSTRIES LTD. - FCC ID: KLLTM-886  
OCCUPIED BANDWIDTH PLOT



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2.1051  
80.211

## Spurious emissions at antenna terminals (conducted):

The data on the following page shows the level of conducted spurious responses. The carrier was modulated 100% using a 2500Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

REQUIREMENTS: Emissions must be  $43 + 10\log(Po)$  dB below the mean power output of the transmitter.

**43 + 10log(5) = 49.99**

**43 + 10log(1) = 43**

TF HIGH POWER	EF	dB below carrier	TF LOW POWER	EF	dB below carrier
156.8	156.8	0	156.8	156.8	0
	313.6	80.4		313.6	79.2
	470.4	93.7		470.4	80.9
	627.2	101		627.2	97.2
	784	103.1		784	96.4
	940.8	91.2		940.8	90.5
	1097.6	95.2		1254.4	87.9
	1254.4	95		1568	87.7

TF HIGH POWER	EF	dB below carrier	TF LOW POWER	EF	dB below carrier
157.42	157.42	0	157.42	157.42	0
	314.84	80.3		314.84	80
	472.26	90.4		472.26	78.9
	629.66	101.5		787.1	94.9
	787.1	104.1		944.52	90.7
	944.52	91.3		157.42	0
	1101.94	96.5		314.84	80
	1259.36	95.1		472.26	78.9
	1416.78	94.3			

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## Method of Measuring Conducted Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was TIA/EIA-603 STANDARD without any exceptions. The measurements were made using the shielded room located at TIMCO ENGINEERING INC. 849 STATE ROAD 45, NEWBERRY FLORIDA 32669.

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2.1053(a)

## Field strength of spurious emissions:

**NAME OF TEST:** RADIATED SPURIOUS EMISSIONS

**REQUIREMENTS:** Emissions must be  $43 + 10\log(P_o)$  dB below the mean power output of the transmitter.

**TEST DATA:**

LOW POWER  $43 + 10\log(1) = 43$

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
156.80	H	0
313.60	H	65.35
470.40	H	91.52
627.20	V	88.56
784.00	H	90.73
940.80	V	83.99
1097.60	V	84.5
1254.40	V	84.21
1411.20	V	76.01
1568.00	V	79.72

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
157.43	H	0
314.86	H	65.95
472.29	H	91.54
629.72	V	91.53
787.15	V	88.04
944.58	V	82.38
1102.01	V	84.76
1259.44	V	83.96
1416.87	V	75.66
1574.30	V	80.62

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2.1053(a)

## Field strength of spurious emissions:

**NAME OF TEST:** RADIATED SPURIOUS EMISSIONS

**REQUIREMENTS:** Emissions must be  $43 + 10\log(Po)$  dB below the mean power output of the transmitter.

**TEST DATA:**

HIGH POWER  $43 + 10\log(5) = 49.99$

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
156.80	V	0
313.60	V	69.34
470.40	V	94.61
627.20	V	96.05
784.00	V	95.82
940.80	V	89.28
1097.60	V	90.49
1254.40	V	87.4
1411.20	V	82.9
1568.00	V	85.31

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
157.43	V	0
314.86	V	71.24
472.29	H	96.83
629.72	V	97.62
787.15	V	94.73
944.58	V	88.67
1102.01	V	90.85
1259.44	V	89.05
1416.87	V	81.83
1574.30	V	87.01

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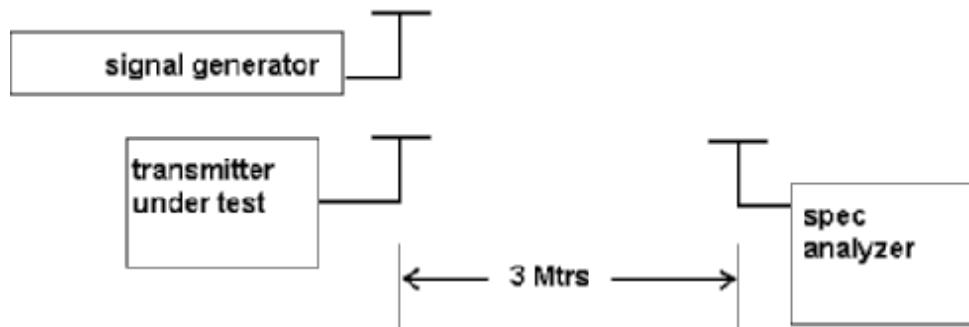
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2.1053(a)

Continued Field\_strength\_of\_spurious\_emissions:

## Method of Measuring Radiated Spurious Emissions



**METHOD OF MEASUREMENT:** The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of TIMCO ENGINEERING, INC. located at 849 N.W. State Road 45, Newberry, FL 32669.

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## Frequency stability:

2.1055(a)(2)

80.209 (a)

Temperature and voltage tests were performed to verify that the frequency remains within the .0010%, 10.0ppm specification limit, for 20kHz spacing. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25° C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30° C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 sec intervals. The worst-case number was recorded for temperature plotting. This procedure was repeated in 10-degree increments up to + 50° C.

Readings were also taken at minus 15% of the battery voltage, which we estimate to be the battery endpoint.

## **MEASUREMENT DATA:**

Assigned Frequency (Ref. Frequency): 156.800017

TEMPERATURE °C	FREQUENCY MHz	PPM
-30C	156.799558	-2.93
-20C	156.799618	-2.54
-10C	156.799731	-1.82
0C	156.799902	-0.73
10C	156.799974	-0.27
20C	156.800017	0.00
30C	156.800014	-0.02
40C	156.800247	1.47
50C	156.800437	2.68

Batt. Volts	PPM
-15% 6.12	-0.02
+15% 8.28	-0.06

RESULTS OF MEASUREMENTS: The test results indicates that the EUT meets the requirements.

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## EMC Equipment List

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/27/04	3/26/07
3-Meter OATS	TEI	N/A	N/A	Listed 1/13/03	1/12/06
Biconnical Antenna	Eaton	94455-1	1057	CAL 3/18/03	3/18/05
Biconnical Antenna	Eaton	94455-1	1096	CAL 8/17/04	8/17/06
Biconnical Antenna	Electro-Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 4/13/05	4/13/07
Blue Tower RF Preselector	HP	85685A	2926A00983	CAL 8/3/05	8/3/07
Blue Tower Spectrum Analyzer	HP	8568B	2928A04729 2848A18049	CAL 4/13/05	4/13/07
Double-Ridged Horn Antenna	Electro-Metrics	RGA-180	2319	CAL 12/29/04	12/29/06
LISN	Electro-Metrics	ANS-25/2	2604	CAL 8/27/04	8/27/06
LISN	Electro-Metrics	EM-7820	2682	CAL 4/28/05	4/28/07
Log-Periodic Antenna	Eaton	96005	1243	CAL 5/8/03	5/8/05

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