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FCC PART 97 AMATEUR RADIO TEST REPORT

Applicant	TOKYO HY-POWER LABS, INC.
Address	1-1 HATANAKA 3-CHOME
	NIIZA SAITAMA 352-0012 JAPAN
FCC ID	UB9HL-2500FX
Model Number	HL-2500FX
Product Description	HF 50 MHz LINEAR POWER AMPLIFIER
Date Sample Received	6/26/2013
Date Tested	7/18/2013
Tested By	Joe Scoglio
Approved By	Joe Scoglio
Report Number	1122AUT13TestReport.docx
Test Results	☒ PASS ☐ FAIL

ACCREDITED
Certificate # 0955-01

TABLE OF CONTENTS

GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

Summary

The device under test does:
☒ fulfill the general approval requirements as identified in this test report
☐ not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.

Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, Fl 32669

Authorized Signatory Name:

Joe Scoglio
Engineering Project Manager

Date: 7/18/2013

GENERAL INFORMATION

DUT Specification

The test results relate only to the items tested.	
DUT Description	HF 50 MHz LINEAR POWER AMPLIFIER
FCC ID	UB9HL-2500FX
Model Number	HL-2500FX
Serial Number	N/A
Operating Frequency	1.8-54 MHz
Type of Emission	N/A
DUT Power Source	☒ 240 VAC/50– 60Hz; 120 VAC/50-60Hz
	☐ DC Power
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☒ Fixed
	☐ Mobile
	☐ Portable

Test Facility: The test sites used by Timco Engineering Inc. for radiated and conducted emission data are located at 849 NW State Road 45 Newberry, FL 32669 USA.

Test Condition: The DUT was tested in the laboratory in an environment with normal temperature and humidity. The temperature was 26ºC with a relative humidity of 50%.

Modification to the DUT: No modification was made to the DUT during testing.

Test Exercise (e.g. software description, test signal, etc.): The DUT was placed in continuous transmit mode of operation.

Applicable Standards: ANSI/TIA 603-C: 2004 & ANSI C63.4 – 2003
FCC CFR 47 Part 97
FCC CRF 47 Part 15

Other information:

The amplifier is capable of operation in the amateur radio bands below 30 MHz and additionally in the 6 meter amateur band (50-54 MHz). The amplifier is shipped with the frequencies from 26 MHz and 28 MHz bands disabled and inoperative.

1. The amplifier is incapable of amplification above 54 MHz.

2. The amplifier requires a minimum of 65 to 80 Watts of drive to obtain full output power.

3. The gain of the amplifier is less than 15 dB on all bands and under all conditions.

5. The amplifier in the off or standby state does not amplify and merely passes through the exciter energy to the antenna port. The spurious emissions of the transceiver were unaffected.

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	12/31/11	12/31/13
3-Meter OATS	TEI	N/A	N/A	12/31/11	12/31/13
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/11	12/31/13
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	10/28/11	10/28/13
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	10/28/11	10/28/13
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	10/28/11	10/28/13
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	10/28/11	10/28/13
Antenna: Active Loop	ETS-Lindgren	6502	00062529	09/23/10	09/23/13
Antenna: Biconnical	Eaton	94455-1	1096	05/10/13	05/10/15
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	06/13/12	06/13/14
Antenna: Double-Ridged Horn/ETS Horn 1	ETS-Lindgren	3117	00035923	12/07/11	12/07/13
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	10/05/12	10/05/14
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	05/09/13	05/09/15
Antenna: Passive Loop	EMC Test Systems	EMCO 6512	9706-1211	06/14/12	06/14/14
Audio Generator	B&K Precision	3010	8739686	09/11/12	09/11/14
Bi-Directional Coupler	HP	778D	1144A01731	05/06/13	05/06/15
Bi-Directional Coupler	HP	778D	1144A08107	05/06/13	05/06/15
Coaxial Cable - Chamber 3 cable set	Semiflex	Unknown		01/26/12	01/26/14

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
DC Power Supply	HP	6264B		05/06/13	05/06/15
Digital Multimeter	Fluke	77	34591991	06/27/11	06/27/13
Digital Multimeter	Fluke	77	35053830	09/09/11	09/09/13
EFT Attenuator	Thermo	EFT-ATTN-1K	0612360	05/17/13	05/17/15
Electric Field Sensor	Amplifier Research	FP6001	302504	04/11/11	04/11/13
ELF Magnetic Field Meter	F.W. Bell	4070	114073	01/16/12	01/16/14
EMC CTC-3 for ESD	Thermo	CTC-3	0701187	03/28/12	03/28/14
EMC ESD Simulator	Thermo	MZ15/EC	0612309	01/19/12	01/19/14
EMI RECEIVER SYSTEM	AGILENT TECHNOLOGIES	8572A	2627A03154	09/15/11	09/15/13
EMI Test Receiver	Rhode & Schwarz	ESIB 40	100274	03/13/12	03/16/14
Injection Probe	Fischer Custom Communications	F-120-9A	270	12/04/12	12/04/14
Isotropic Field Probe	Amplifier Research	FP5000	22839	06/25/12	06/25/14
LISN	Electro-Metrics	ANS-25/2	2604	10/28/11	10/28/13
LISN	Electro-Metrics	EM-7820	2682	02/26/13	02/26/15
Measuring Tape-20M	Kraftixx	0631-20		05/20/13	05/20/15
Measuring Tape-7.5M	Kraftixx	7.5M PROFI		05/20/13	05/20/15
Modulation Analyzer	HP	8901A	3050A05856	09/26/12	09/26/14
Oscilloscope	Lecroy	LC584AM	10605	01/19/13	01/19/15
Oscilloscope	LeCroy	LT364	00414	09/08/11	09/08/13
Passive Impedance Adapter	Fischer Custom Communications	FCC-801-150-50-CDN	01117 & 01118	01/28/13	01/28/15
Power Line Coupling/Decoupling Network	Fischer Custom Communications	FCC-801-M2-16A	01048	01/29/13	01/29/15
Power Line Coupling/Decoupling Network	Fischer Custom Communications	FCC-801-M3-16A	01060	01/29/13	01/29/15
Radiating Field Coil	Fischer Custom Communications	F-1000-4-8/9/10-L-1M	9859	06/26/12	06/26/14
RF Power Amplifier	Ophir RF	5126F	1015	02/22/13	02/22/15
RF Power Amplifier	Ophir RF	5150F	1041	02/22/13	02/22/15
RF Power Meter	Boonton	4531		01/19/13	01/19/15
Sensor	Boonton	51072A	34647	01/19/13	01/19/15
Signal Generator	HP	8648C	3623A02898	09/09/11	09/09/13

TEST PROCEDURES:

Radiation Interference: The test procedure used was ANSI/TIA 603-C: 2004 using a Agilent spectrum analyzer with a preselector. In the frequency range 10 kHz to 30 MHz the RBW was 10 kHz and from 30-1000 MHz the RBW of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a micro volt at the output of the antenna. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz.

Formula of Conversion Factors: The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

Freq (MHz)	Meter Reading	+ ACF	+ CL	= FS
33	20 dBuV	+ 10.36 dB/m	+0.4 dB	= 30.76 dBuV/m @ 3m

Part 97.313

Output Power shall not exceed 1.5 kW PEP Watts into a 50 ohm resistive load. There are no user power controls.

Part 2.1033(c)(8)

DC Voltages and Current into Final Amplifier:

INPUT POWER – (46 Volts)(50 Amps) = 2300 Watts tested at 14.1 MHz

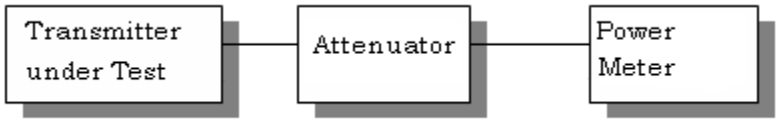
RF POWER OUTPUT

Rule Parts No.: Part 2.1046(a), Part 97.313

Requirements: 97.313

Test Procedure: RF power is measured by connecting a 50-ohm, resistive wattmeter to the RF output connector with a nominal input voltage of 240 AC Volts.

Test Setup:



Test Data:

Output Power:
(Input/Output: Not to exceed 15 dB Gain)

HIGH POWER

TF	Input	Output	Watts	Gain
MHz	dBm	dBm		dB
1.81	49	61.8	1500	12.8
14.1	49	61.7	1479	12.7
29.5	49	61.5	1412	12.5
50.1	49	60.0	1000	11
53.9	49	59.9	980	10.9

LOW POWER

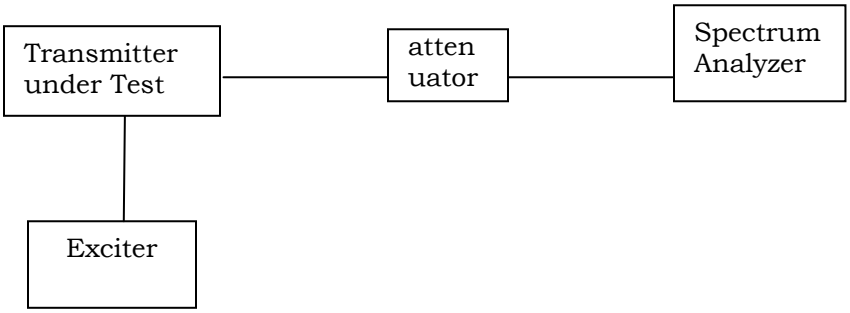
TF	Input	Output	Watts	Gain
MHz	dBm	dBm		dB
1.81	49	60.0	1000	11
14.1	49	59.8	955	10.8
29.5	49	59.6	912	10.6
50.1	49	58.4	692	9.4
53.9	49	58.3	676	9.3

STRENGTH OF CONDUCTED SPURIOUS EMISSIONS

Rule Parts No.: Part 2.1053 & Part 97.307 (d) (e)

Requirements: The FCC Limits for spurious emissions of a transmitting operating on a frequency below 30 MHz must be at least 43dB below the mean power. For the transmitter frequency operating at 50 MHz, the RF spurious emissions must be at least 60 dB below the mean power of the fundamental.

Method of Measurements:
Test Setup:



Test Data:

HIGH POWER

TF (MHz)	EF (MHz)	dB below carrier	43 dB Below Fundamental
1.81	1.81	0	N/A
	3.62	63.8	PASS
	5.43	61.1	PASS
	7.24	73.6	PASS
	9.05	64	PASS
	10.8	74.1	PASS
	12.6	75.4	PASS
	14.4	72.9	PASS
	16.2	77	PASS
	18.1	73.4	PASS

LOW POWER

TF (MHz)	EF (MHz)	dB below carrier	43 dB Below Fundamental
1.81	1.81	0	N/A
	3.62	66.1	PASS
	5.43	60.7	PASS
	7.24	72.7	PASS
	9.05	62.3	PASS
	10.8	73.9	PASS
	12.6	61	PASS
	14.4	71.6	PASS
	16.2	69.4	PASS
	18.1	72.3	PASS

HIGH POWER

TF (MHz)	EF (MHz)	dB below carrier	43 dB Below Fundamental
14.1	14.1	0	N/A
	28.2	66.3	PASS
	42.3	61.5	PASS
	56.4	76	PASS
	70.5	71.8	PASS
	84.6	76.5	PASS
	98.7	67.9	PASS
	112.8	77.2	PASS
	126.9	75.9	PASS
	141	74.6	PASS

LOW POWER

TF (MHz)	EF (MHz)	dB below carrier	43 dB Below Fundamental
14.1	14.1	0	N/A
	28.2	66.1	PASS
	42.3	61.3	PASS
	56.4	75.2	PASS
	70.5	71	PASS
	84.6	76.5	PASS
	98.7	68.8	PASS
	112.8	74.8	PASS
	126.9	73.1	PASS
	141	75.4	PASS

HIGH POWER

TF (MHz)	EF (MHz)	dB below carrier	43 dB Below Fundamental
29.5	29.5	0	N/A
	59	61.9	PASS
	88.5	70.7	PASS
	118	71.7	PASS
	147.5	71.5	PASS
	177	74.1	PASS
	206.5	66.3	PASS
	236	74.9	PASS
	265	75.6	PASS
	295	76.3	PASS

LOW POWER

TF (MHz)	EF (MHz)	dB below carrier	43 dB Below Fundamental
29.5	29.5	0	N/A
	59	65.6	PASS
	88.5	75.6	PASS
	118	70.8	PASS
	147.5	84.1	PASS
	177	86.6	PASS
	206.5	81.8	PASS
	236	85.6	PASS
	265	85.5	PASS
	295	89.8	PASS

HIGH POWER

TF (MHz)	EF (MHz)	dB below carrier	60 dB Below Fundamental
50.1	50.1	0	N/A
	100.2	84.6	PASS
	150.3	93.8	PASS
	200.4	95.7	PASS
	250.5	91.4	PASS
	300.6	99.8	PASS
	350.7	98.8	PASS
	400.8	105.1	PASS
	450.9	105	PASS
	501	105	PASS

LOW POWER

TF (MHz)	EF (MHz)	dB below carrier	60 dB Below Fundamental
50.1	50.1	0	N/A
	100.2	80.6	PASS
	150.3	93.1	PASS
	200.4	99.1	PASS
	250.5	90.3	PASS
	300.6	100	PASS
	350.7	97.7	PASS
	400.8	103.6	PASS
	450.9	103.4	PASS
	501	103.4	PASS

HIGH POWER

TF (MHz)	EF (MHz)	dB below carrier	60 dB Below Fundamental
53.9	53.9	0	N/A
	107.8	82.2	PASS
	161.7	91.8	PASS
	215.6	86.3	PASS
	269.5	105.4	PASS
	323.4	106.4	PASS
	377.3	104.9	PASS
	431.2	103.9	PASS
	485.1	104.9	PASS
	539	104.9	PASS

LOW POWER

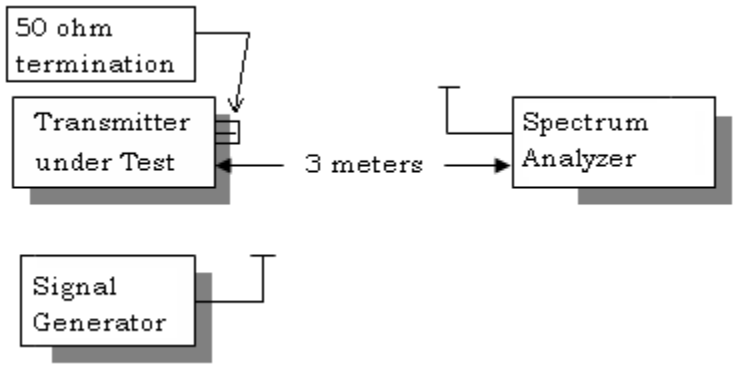
TF (MHz)	EF (MHz)	dB below carrier	60 dB Below Fundamental
53.9	53.9	0	N/A
	107.8	79.7	PASS
	161.7	96.8	PASS
	215.6	81.1	PASS
	269.5	104.3	PASS
	323.4	105.1	PASS
	377.3	102.3	PASS
	431.2	103.3	PASS
	485.1	103.3	PASS
	539	103.2	PASS

STRENGTH OF RADIATED SPURIOUS EMISSIONS

Rule Parts No.: Part 2.1053 & Part 97.307 (d) (e)

Requirements: The FCC Limits for spurious emissions of a transmitting operating on and above 50 MHz, the RF spurious emissions must be at least 60 dB below the mean power of the fundamental.

Method Of Measurements:
Test Setup:



Test Data:

HIGH POWER

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
50.10	V	0
100.20	H	96.5
150.30	V	91.5
200.40	H	90.9
250.50	H	101.7
300.60	V	97.6
350.70	V	96.3
400.80	H	106.0
450.90	H	118.6
501.00	V	121.0

LOW POWER

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
50.10	V	0
100.20	V	91.9
150.30	V	93.0
200.40	H	85.4
250.50	H	97.3
300.60	V	93.9
350.70	V	93.7
400.80	H	104.0
450.90	V	115.6
501.00	V	117.0

HIGH POWER

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
53.90	V	0
107.80	H	94.8
161.70	V	91.8
215.60	H	91.3
269.50	H	99.7
323.40	V	98.9
377.30	V	97.0
431.20	H	103.4
485.10	H	118.8
539.00	V	123.1

LOW POWER

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
53.90	V	0
107.80	V	92.0
161.70	V	93.3
215.60	H	85.5
269.50	H	95.0
323.40	V	95.0
377.30	V	94.9
431.20	H	101.8
485.10	V	113.8
539.00	V	119.3