**LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY**

*LIGO Laboratory / LIGO Scientific Collaboration*

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# Test Procedure for Test Oscillator Boxes.

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# 1 Introduction

The following Test Procedure descrbes the test of proper operation of the Test Oscillator Boxes.

s/n __S1103741_____ Tested by ____PBS_____

# 2 Test Equipment

- Voltmeter
- Oscilloscope
- Stanford Research SR785 analyzer
- RF Power Meter HP E4418A or Agilent N1914A
- Board Schematics—D1100663

# 3 Tests

*The Test Oscillators use the Low Noise Power Module (D0901846-D).*

1) **Verify the proper current draw.** Using a bench DC supply apply +- 24Volts to P7 and +-17 Volts to P6 of the low noise power Module (D0901846-D). Measure the current draw of the board.

+24 Volt current _____0.1 A Nom. -24 Volt current _____0.0 A Nom.

+17 Volt current ___1.405A_____ less than 1.1 A

-17 Volt current __0.055A_____ less than 0.01 A

2) **On the low noise power module check the voltage on TP 1-13.**

TP1 ( +17V ) ___22.36V_____ TP2 (-17V ) ____-23.07V_____

TP3 , 4 ( GND ) TP5 (+ 5V)____5.02V_____

TP6 (-15V ) ___-14.98V__ TP7 (+24V ) ___22.4V_____

TP8 ( GND ) TP9 ( -24V ) __-23.07V_____

TP10 ( GND ) TP11 (+15V ) __14.99V_____

TP12 (+VREF ) __9.99V_____ TP13 (-VREF) _-9.99V_____

**3) If TP 1 , 2, 7 , 9 and 8 are correct then TP14 ( OK ) should be Logic high ~3Volts. Confirm._____X_____**

**4) The noise on TP 12, 13, 11 and 6 should be measured with a SR785 using an rms power spectrum.**

TP12 noise __12.94 nVrms/sqrt Hz____ less than 20 nVrms/sqrt Hz at 140 Hz

TP13 noise __14.9 nVrms/sqrt Hz_____ less than 20 nVrms/sqrt Hz at 140 Hz

TP11 noise __13.67 nVrms/sqrt Hz_____ less than 20 nVrms/sqrt Hz at 140 Hz

TP6 noise ___28.25 nVrms/sqrt Hz_____ _ less than 30 nVrms/sqrt Hz at 140 Hz.

This concludes the test of the power supply. Now test the crystal oscillators.

**5) With the frequency control input grounded measure the RF output with a RF Power meter.** The nominal output level is 12 dBm +/- 2dBm.

RF Output levels (dBm)

| OSC1 | OSC2 | OSC3 | OSC4 |
|---|---|---|---|
| 11.85 | 10.39 | 10.72 | 11.01 |

5) **Apply a dc voltage to the frequency control input.** Measure the output frequency as a function of input voltage. The frequency change is typically 50 ppm for +/- 10 volt input.

Oscillator 1 frequency change for 10 Volt input change _____ ppm

Oscillator 2 frequency change for 10 Volt input change _____ ppm.

Oscillator 3 frequency change for 10 Volt input change _____ ppm.

Oscillator 4 frequency change for 10 Volt input change _____ ppm

Oscillator 1, Center Frequency = 10.000 006 MHz

| | | | | | |
|---|---|---|---|---|---|
| Frequency | 9999 | 0000 | 0001 | 0002 | 0002 |
| Voltage | 10 | 9 | 8 | 7 | 6 |
| Voltage | 1 | 2 | 3 | 4 | 5 |
| Frequency | 0006 | 0005 | 0004 | 0003 | 0003 |
| Frequency | 0007 | 0008 | 0008 | 0009 | 0010 |
| Voltage | -1 | -2 | -3 | -4 | -5 |
| Voltage | -10 | -9 | -8 | -7 | -6 |
| Frequency | 0013 | 0012 | 0012 | 0011 | 0010 |

Oscillator 2, Center Frequency = 39.999 916 MHz

| | | | | | |
|---|---|---|---|---|---|
| Frequency | 7548 | 7748 | 7956 | 8172 | 8397 |
| Voltage | 10 | 9 | 8 | 7 | 6 |
| Voltage | 1 | 2 | 3 | 4 | 5 |
| Frequency | 9646 | 9382 | 9124 | 8873 | 8631 |
| Frequency | 0192 | 0471 | 0753 | 1039 | 1327 |
| Voltage | -1 | -2 | -3 | -4 | -5 |
| Voltage | -10 | -9 | -8 | -7 | -6 |
| Frequency | 2791 | 2496 | 2202 | 1908 | 1617 |

Oscillator 3, Center Frequency = 159.999 648 MHz

| | | | | | |
|---|---|---|---|---|---|
| Frequency | 9990 | 0930 | 1877 | 2831 | 3791 |
| Voltage | 10 | 9 | 8 | 7 | 6 |
| Voltage | 1 | 2 | 3 | 4 | 5 |
| Frequency | 8664 | 7681 | 6703 | 5728 | 4757 |
| Frequency | 0646 | 1639 | 2634 | 3630 | 4631 |
| Voltage | -1 | -2 | -3 | -4 | -5 |
| Voltage | -10 | -9 | -8 | -7 | -6 |
| Frequency | 9648 | 8642 | 7638 | 6634 | 5632 |

Oscillator 4, Center Frequency = 78.890 172 MHz

| | | | | | |
|---|---|---|---|---|---|
| Frequency | 4633 | 5149 | 5673 | 6207 | 6750 |
| Voltage | 10 | 9 | 8 | 7 | 6 |
| Voltage | 1 | 2 | 3 | 4 | 5 |
| Frequency | 9593 | 9014 | 8438 | 7867 | 7304 |
| Frequency | 0750 | 1321 | 1887 | 2443 | 2990 |
| Voltage | -1 | -2 | -3 | -4 | -5 |
| Voltage | -10 | -9 | -8 | -7 | -6 |
| Frequency | 5537 | 5053 | 4556 | 4047 | 3525 |