LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

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Test Procedure for RF Preamplifier

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1 Introduction

The following Test Procedure describes the test of proper operation of the RF Preamplifier. The unused outputs should always be properly terminated.

2 Test Equipment

- Voltmeter
- Oscilloscope
- Stanford Research SR785 analyzer
- Tektronix AFG3101 function generator (or similar)
- RF Power Meter HP E4418A
- Board Schematics--D1201294

3 Tests

The RF Preamplifier comes with the Low Noise Power Module (D0901846.

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). Measure the current draw of the board.

   +24 Volt current _____ 0.1 A Nom.

   –24 Volt current _____ 0.0 A Nom.

   +17 Volt current _____ less than 0.1 A

   –17 Volt current _____ less than 0.01 A

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

TP1 (+17V) _____ TP2 (-17V) _____

TP3 , 4 (GND) TP5 (+ 5V)_____

TP6 (-15V) _____ TP7 (+24V) _____

TP8 (GND) TP9 (-24V) _____

TP10 (GND) TP11 (+15V) _____

TP12 (+VREF) _____ TP13 (-VREF) _____

3) If TP 1 , 2, 7 , 9 and 8 are correct then pin 5 on U1 and U7, TP14 (OK) should be Logic high ~3Volts. The front panel LED should be on.

Confirm._____

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

TP12 noise _____less than 200 nVrms/sqrt Hz at 140 Hz

TP13 noise _____less than 900 nVrms/sqrt Hz at 140 Hz

TP11 noise _____ less than 1 uVrms/sqrt Hz at 140 Hz

TP6 noise _____ less than 1 uVrms/sqrt Hz at 140 Hz.

5) Test the RF output powers by applying a 40 MHz/-13dBm RF signal to J1. With a RF power meter measure the power at the three outputs. Nominal output power is -14 dBm for the direct and 0 dBm for outputs 1 and 2.

Outputs

Output	**Measured Pwr**		**Output**	**Measured Pwr**
Direct			**1**	
			2	

7) Measure the phase noise of the RF Oscillator Source driving the RF Preamplifier using the Wenzel single channel phase noise measurement technique (3.5.3), Figure 3.5.2-1, which can be found at

http://www.wenzel.com/pdffiles1/BP1000Manual/BP_1000_v101_2_.pdf .

A reasonable FFT analyzer is the SR785, which can be set to measure power units if you start in Display Setup. A Reference Source must be provided which can be just a Wenzel crystal oscillator of frequency close enough to lock, properly powered and connected to the Wenzel phase noise measurement system. The output of the RF Distribution Amplifier will need to be attenuated to the amplitude needed by the wenzel phase noise measurement system (about 10 dBm). Test all the outputs that have different amplifiers. Compare to the Phase noise of the RF Oscillator Source alone, it should be within 3dB.

J3

Offset freq. Hz	**Phase noise spec.**	**RF osc. phase noise**	**RF osc/amp noise**
10 Hz	**-100 dBc/Hz**		
100 Hz	**-135 dBc/Hz**		
1 kHz	**-135 dBc/Hz**		

J4

Offset freq. Hz	**Phase noise spec.**	**RF osc. phase noise**	**RF osc/amp noise**
10 Hz	**-100 dBc/Hz**		
100 Hz	**-135 dBc/Hz**		
1 kHz	**-135 dBc/Hz**		