LUNA TECHNOLOGIES
A Division of Luna Innovations Incorporated

ADVANCED OPTICAL TESTING FOR COMPONENTS & ASSEMBLIES

Using the Phoenix 1400 Tunable Laser for Heterodyne Laser Linewidth Measurements

A Luna Technologies Application Note

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1 Introduction

Luna Technologies' Phoenix 1400 Tunable Laser System is an ideally suited external cavity laser for heterodyne linewidth measurements with highly linear mode-hop free tunability, low noise, narrow line width and internal gas cell and power monitors.

This application note details the setup and procedure for measuring the linewidth of a C band laser using the Phoenix 1400 TLS.

2 Basic Measurement Setup

The Phoenix 1400 system and accompanying PC will need to be powered on and the USB 2.0 data transfer cable from the Phoenix 1400 system plugged into an available USB port on the computer. The user should ensure that FC/APC connections are used to mate the WDM filter to the Phoenix 1400 as shown below in figure 1.

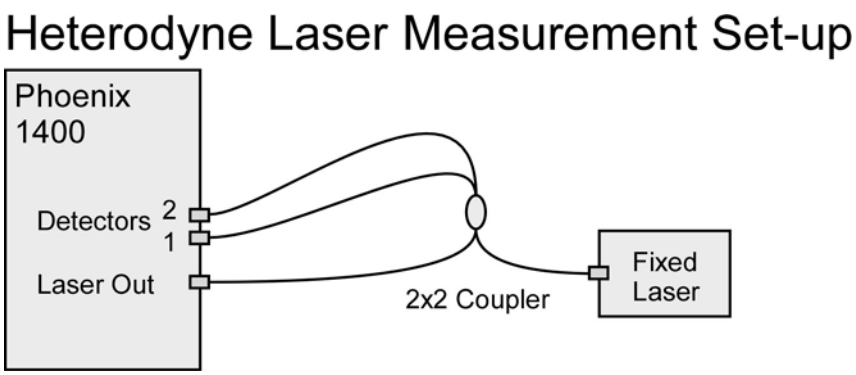

Figure 1. Measurement setup for heterodyne linewidth measurement. The Phoenix 1400 requires FC/APC connections.

Once the device is connected, the user should open the Phoenix 1400 software and specify the parameters of the measurement. This will include the start and end wavelengths, laser sweep rates, laser power, trigger settings and number of sweeps.

The Phoenix TLS should be set up to sweep at a low speed, i.e. 1 nm/s centered on the fixed laser frequency. Additionally, the acquisition rate should be set to the highest frequency allowed by the software.

With these system settings completed, the user checks the data curve selection boxes to display wavelength, power, detector 1, and detector 2 and clicks the 'scan and acquire data' button. Noting that the data acquired at detectors 1 and 2 will be 180 degrees out of phase due to the phase effects of the 2x2 coupler. This data is then saved to a text file and imported to the desired processing software (Lab View, MatLab, etc.) where the following short algorithm is employed.

1. Scale the data from detectors 1 and 2 such that their DC levels are equal.

2. Subtract the two data sets and take the absolute value.

3. The linewidth is simply the FWHM value. This can be expressed in either frequency or wavelength.

Below in figure 2 is a sample of this data

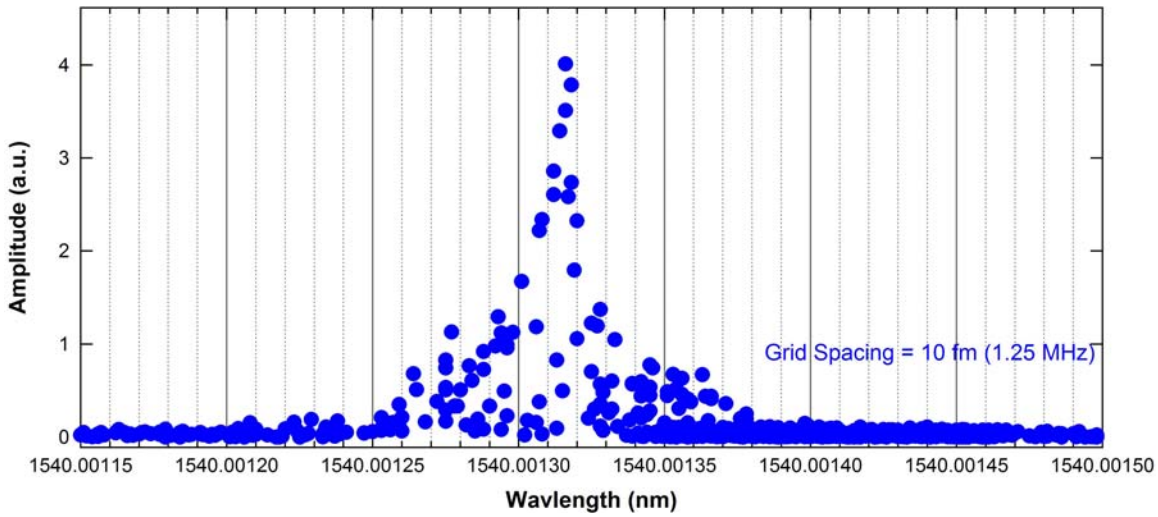

Figure 2. Measurement data for heterodyne linewidth measurement. Plotted is the absolute value of the difference of scaled data from detectors 1 and 2 versus wavelength.

3 Summary

The Phoenix 1400 is ideally suited for fast, accurate and simple heterodyne linewidth measurements over the full C band with highly linear tunability, low noise, and unique built-in wavemeter, gas cell, power meter and optical detectors. With an easy to control interface, the Phoenix 1400 is a turnkey heterodyne linewidth measurement solution.