Different uses for FPI to support laser spectroscopy measurements by

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ISOLFrance Workshop IV



Outline

- Introduction
- Air-spaced etalon
 - Motivation
 - Characterization
 - Offline measurement
- SFPI for relative wavelength measurement
 - Relative wavelength measurements
 - Comparison with WS7
- Summary



Introduction



To perform accurate measurements we need:

- Scan the laser wavelength (without affecting other experimental parameters i.e. laser power)
- Measure the wavelengths steps with good resolution



Introduction

- Exploration of two new uses of Fabry-Perot Interferometer (FPI) on laser spectroscopy
 - 1) Air-spaced etalon

Motivation: Maintain power stable during long frequency scans



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2) Wavelength measurements with SFPI

Motivation: Reduce costs for narrowband wavelength measurements



FPI as Air-spaced etalon

• An etalon is a frequency-selective element made out of two planeparallel partially reflective surfaces.



Air-spaced etalon: Alter the wavelength by changing the distance between the mirrors



Air-spaced etalon – Power vs Frequency

• During long frequency scans, solid etalons introduce a power lose which has an effect on the observed intensity of the resonances.



Drifts on laser power affect on the intensities of the peaks \rightarrow I, μ , Q

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Air-spaced etalon – Linewidth measurements

• Measure of the multimode Ti:sa linewidth using an FPI



Air-spaced etalon – Stability

• The frequency can be stabilized by adjusting the voltage of the piezo



Air-spaced etalon – Stability

- The frequency can be stabilized by adjusting the voltage of the piezo
- Power drift due to temperature increase



Air-spaced etalon – Hot cavity measurement



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SFPI for wavelength measurement

- Objective: Reduce costs
- Explore the use of a Scanning FPI to perform accurate relative wavelength measurements
- Not possible to measure absolute wavelength





Movable Mirror

GISELE setup



SFPI scan measurements – Isotope shift



SFPI scan measurements – Large scans

- How to avoid limitations on the measurement range
- Steps limited to less than half of the FSR





- 1. All the resonances have the same wavelength, track one
- 2. Introduce limits on the scan
- 3. When the peak reaches the limit 'jump' to the next resonance
- 4. Correct by one FSR



Summary

Air-spaced etalon

- Outlook:
 - Development and characterization
 - Offline measurement of stable palladium
- Next step:
 - Online measurements

SFPI for relative wavelength measurements

- Outlook:
 - Development of the code
 - Offline measurement of stable tin and comparision with WS7
- Next step:
 - Improve accuracy on large scan ranges
 - Implement the code on GISELE's data acquisition system

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