

Path Length Stabilization Using a Field Programmable Gate Array

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Draft Abstract: Ultrafast Coherent Multidimensional Spectroscopy is a versatile spectroscopic tool used to gain insight into complicated coherent electronic processes associated with a variety of physically fundamental phenomena. Performing these experiments requires laser path stabilization of $\lambda/100$ or better. Using PI control algorithms to stabilize nested Michelson interferometers, path length stabilization of this quality can be achieved. Previously, analogue PI filters were used for this purpose, we report the development of a new instrument using a Field Programmable Gate Array to digitize and improve upon the performance of the analog filters.

I. INTRODUCTION

Outline

1. Introduction

- 2D background.
- Review of MONSTR configuration.
- Review of current PI filter configuration

2. FPGA filter device

- Analog amplifier circuits (purpose, config., and performance)
- FPGA PI stabilization algorithm
- FPGA liquid crystal/ shutter motor control algorithms

3. Results

- Analog v. FPGA performance (abs. noise reduction, FFT noise analysis)

4. Conclusion

- FPGA algorithm a suitable replacement for analog filters, substantially easier to implement.

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