

Classical Cancellation of Phase and Amplitude Noise

Conor Mow-Lowry

Honours student ANU

Supervisors:

Prof. David McClelland

Dr Malcolm Gray

Classical Cancellation of Phase and Amplitude Noise

- Motivation
- Theory of Noise Cancellation
- Expected Results
- Experimental Design

Motivations for the Classical Experiment

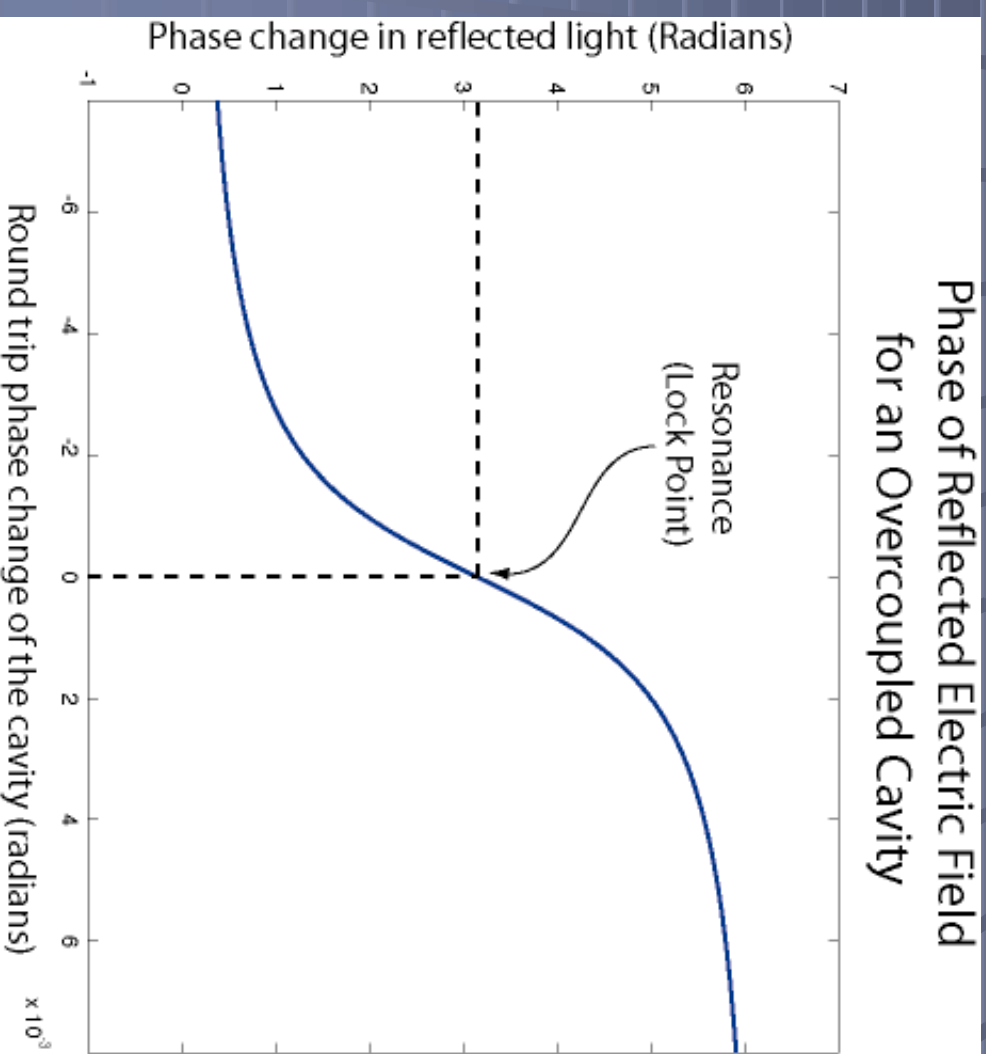
- Analogous to breaching the SQL
- Some similar technical problems to overcome
- Investigation of spring design
- Provides feedback for the layout of the Quantum system

Theory of Noise Cancellation

- We require the cavity to be locked on resonance.
- Phase (or frequency) changes drive the cavity off resonance, and the length must be adjusted to compensate
- If one mirror is on a very light spring, it can be moved by photon pressure
- Thus, it is possible to counter phase changes with amplitude changes.

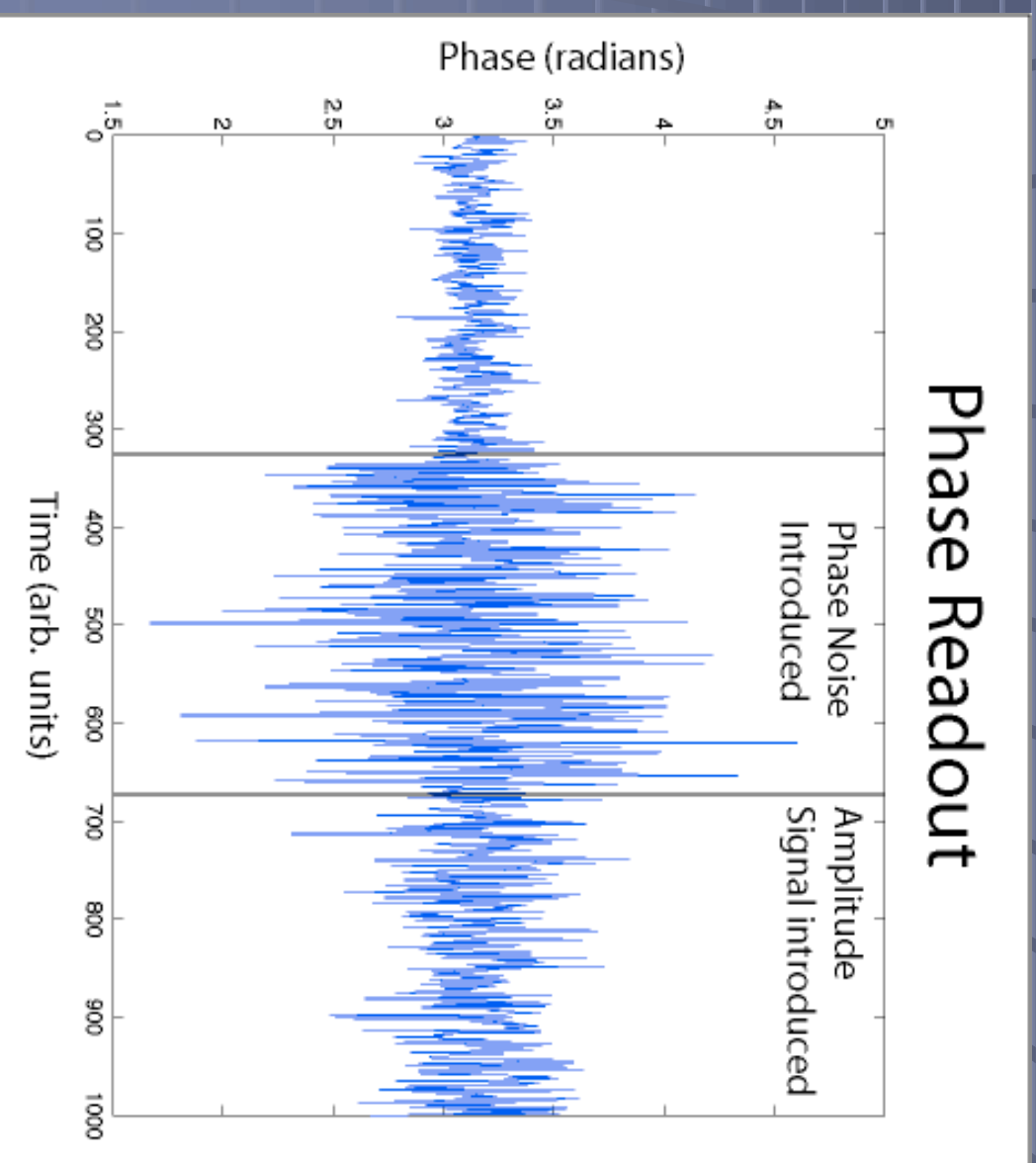
Readout System

- Homodyne detection system
- Phase sensitive measurement
- Shows how far, and in what direction, the cavity is from resonance



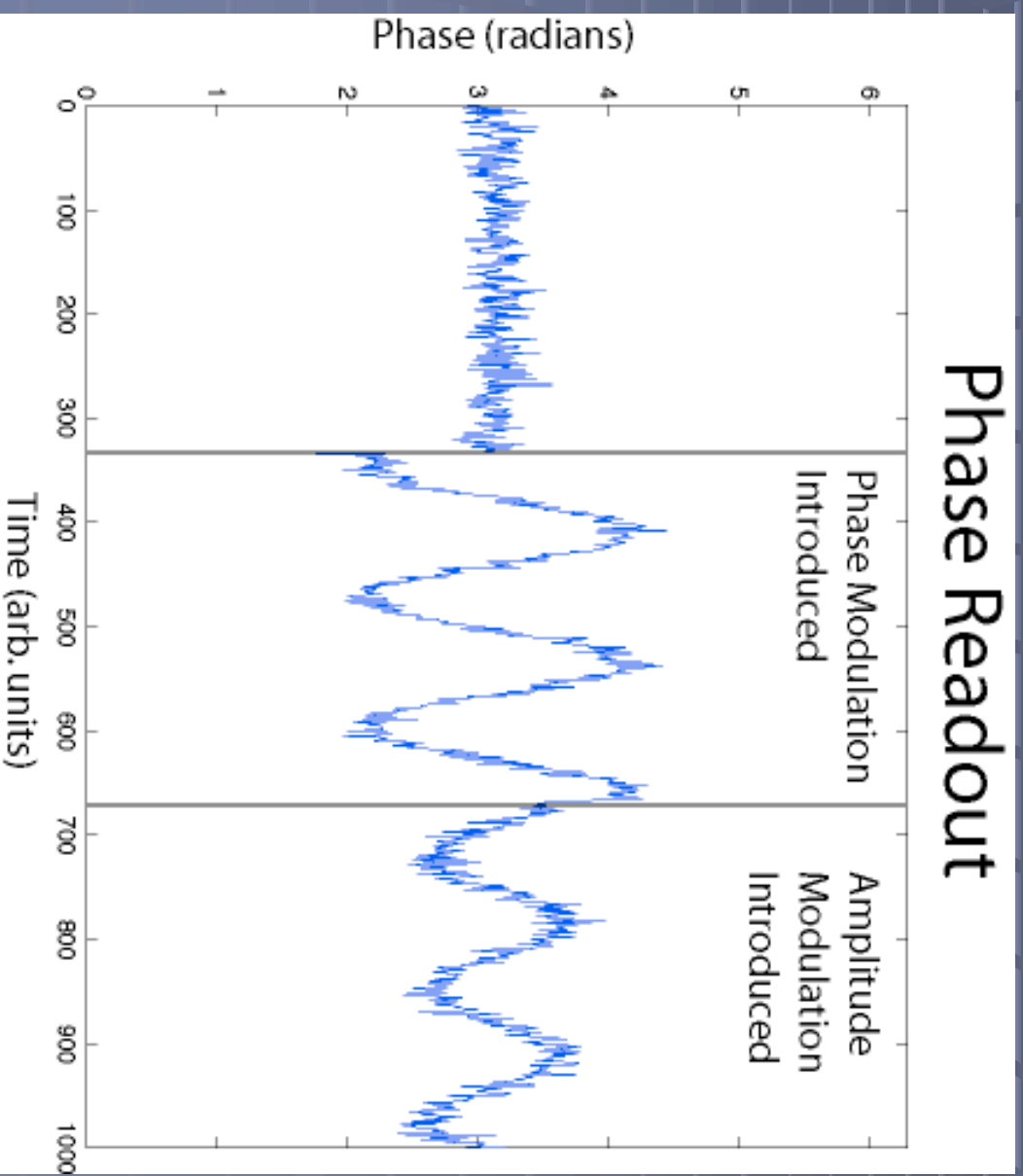
Expected Results

Partial cancellation
of white noise

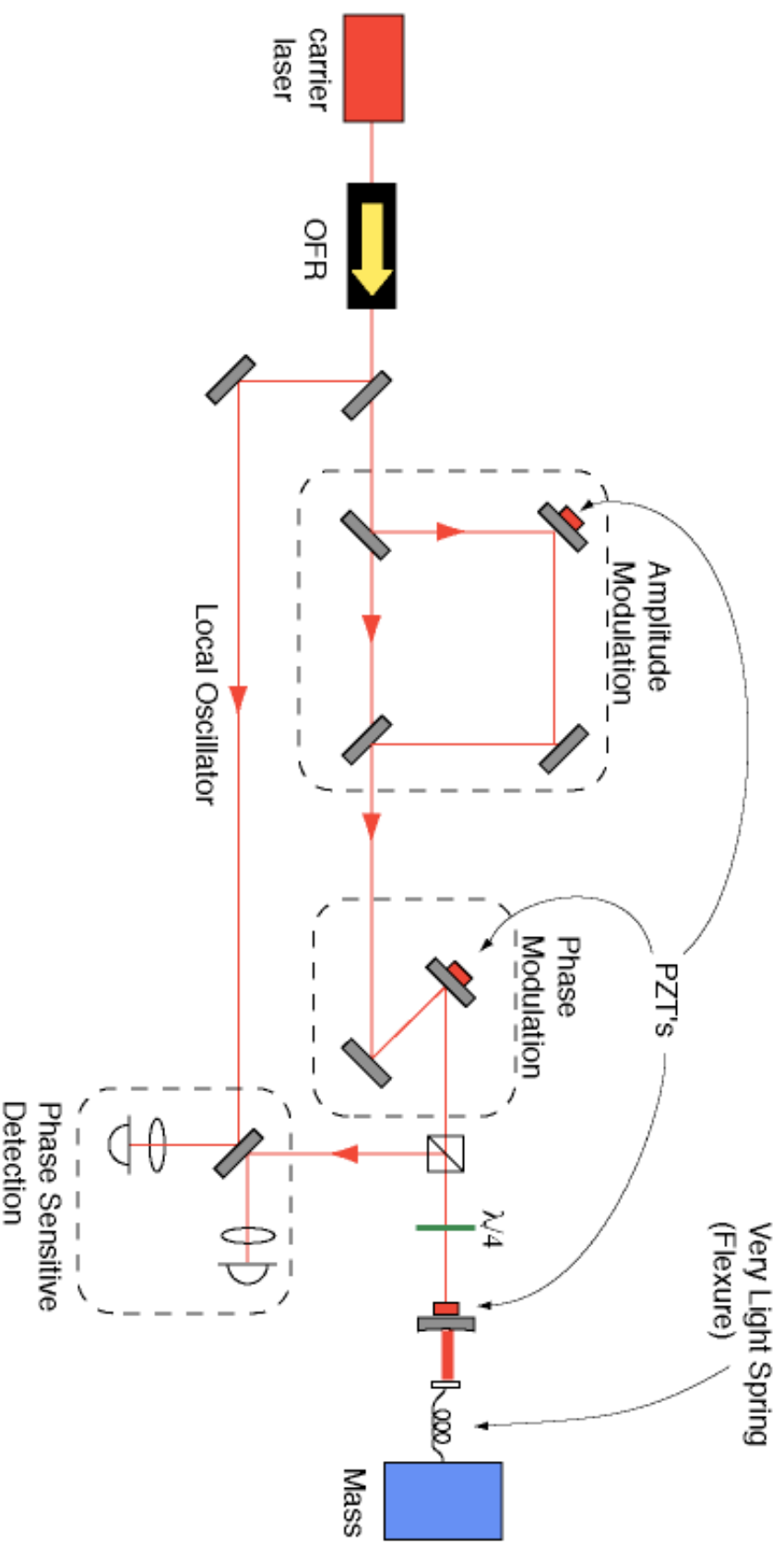


Expected Results

Partial Cancellation
of a phase signal at
one frequency only



Experimental Layout



Objectives

1. To demonstrate single frequency 'noise' cancellation
2. To show partial cancellation of white noise
3. Completion of the first stage of sub-SQL interferometry