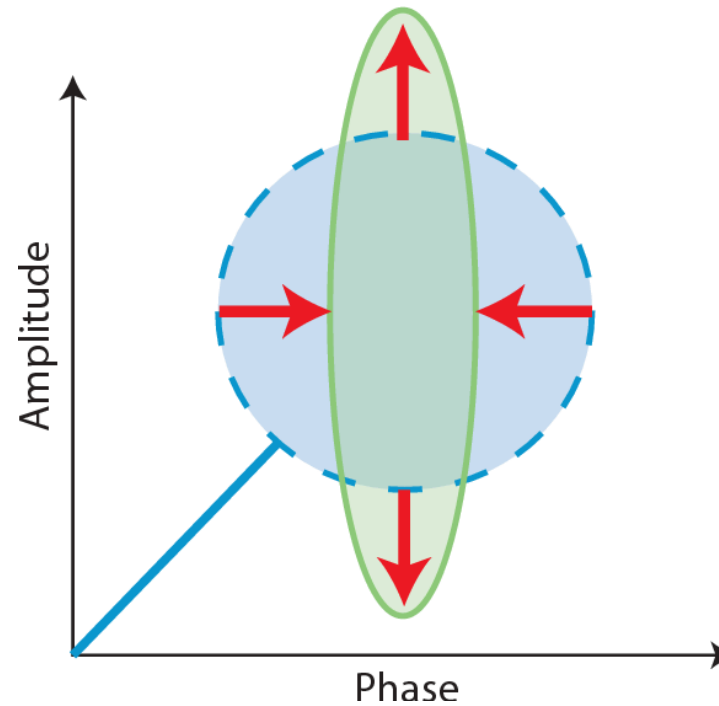


# REU Presentation on Quantum Metrology Project

By Sam Bayliff under Dr. Blume

## Background: What is Quantum Metrology

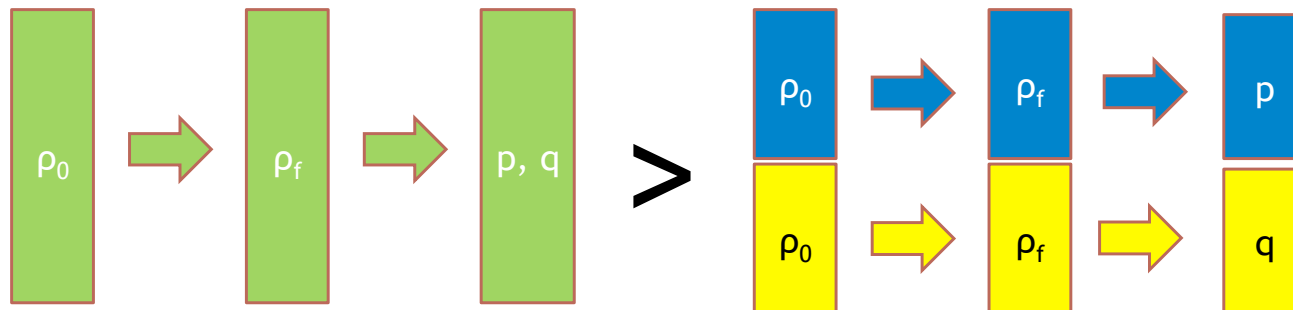
- ▶ Metrology is the study of measurement.
- ▶ Quantum Metrology -> uncertainty of measurements
  - ▶ Different types of wavefunctions can have different lower bounds on uncertainty
  - ▶ Squeezed states, coherent, entangled.



Credit: Benjamin M. Sparkes, Thesis

# My Project

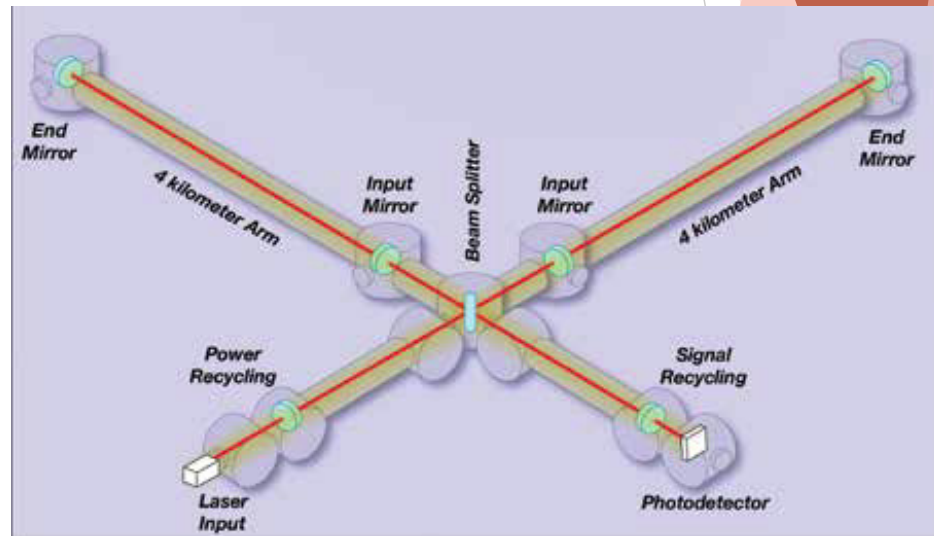
- ▶ I will be expanding an estimation program to estimate the lower bounds for uncertainty in multiple parameters simultaneously in a spinor Bose-Einstein condensate interferometer
- ▶ Studies show simultaneous multiparameter estimation gives better uncertainty than individual estimation.



# Why?

- ▶ Finding ways to decrease interferometer uncertainty allows us to see smaller effects
  - ▶ This can help support theories predicting small changes caused by some effect
  - ▶ LIGO and gravitational waves
  - ▶ Gives insight into how the system evolves.

LIGO/Shane Larson



# Questions and Comments

- ▶ Take comments
  - ▶ Or questions.

