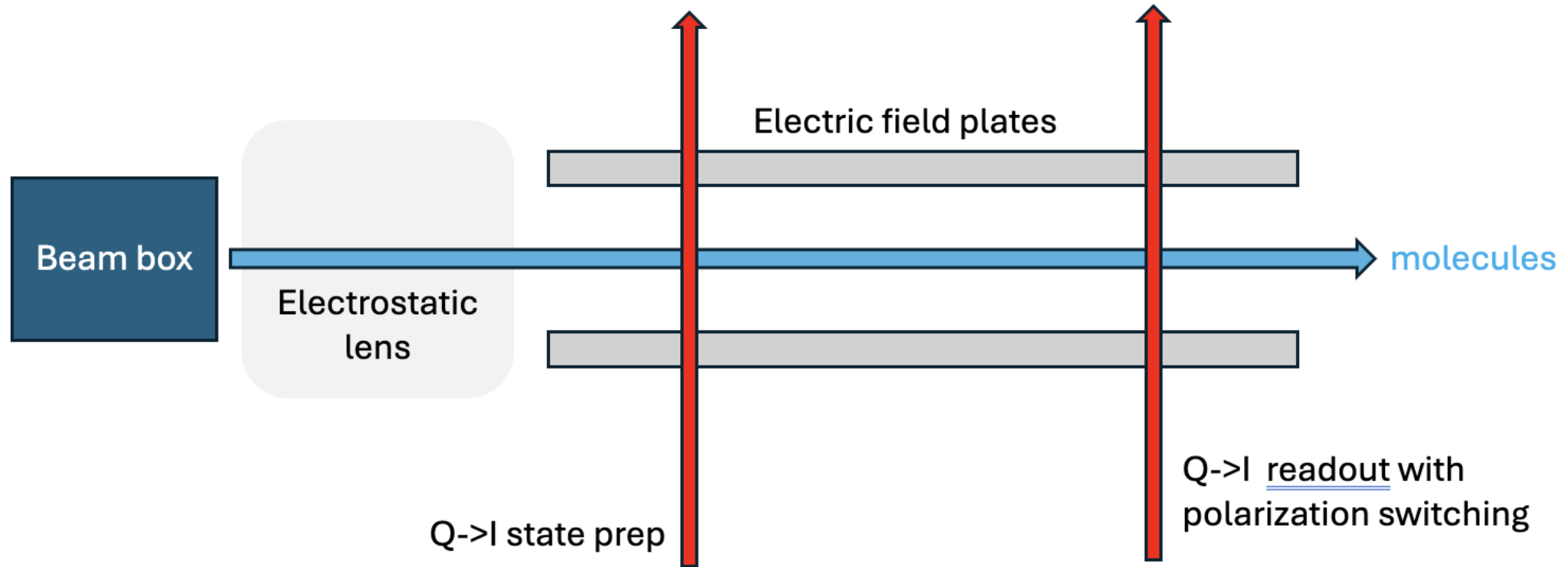


Comagnetometry Status

- Successfully measured B field with both transverse and longitudinal state prep 😊
 - Since longitudinal gives more information about spatial distribution of the field, probably will primarily use this method going forward.
 - Still tidying up a few things...

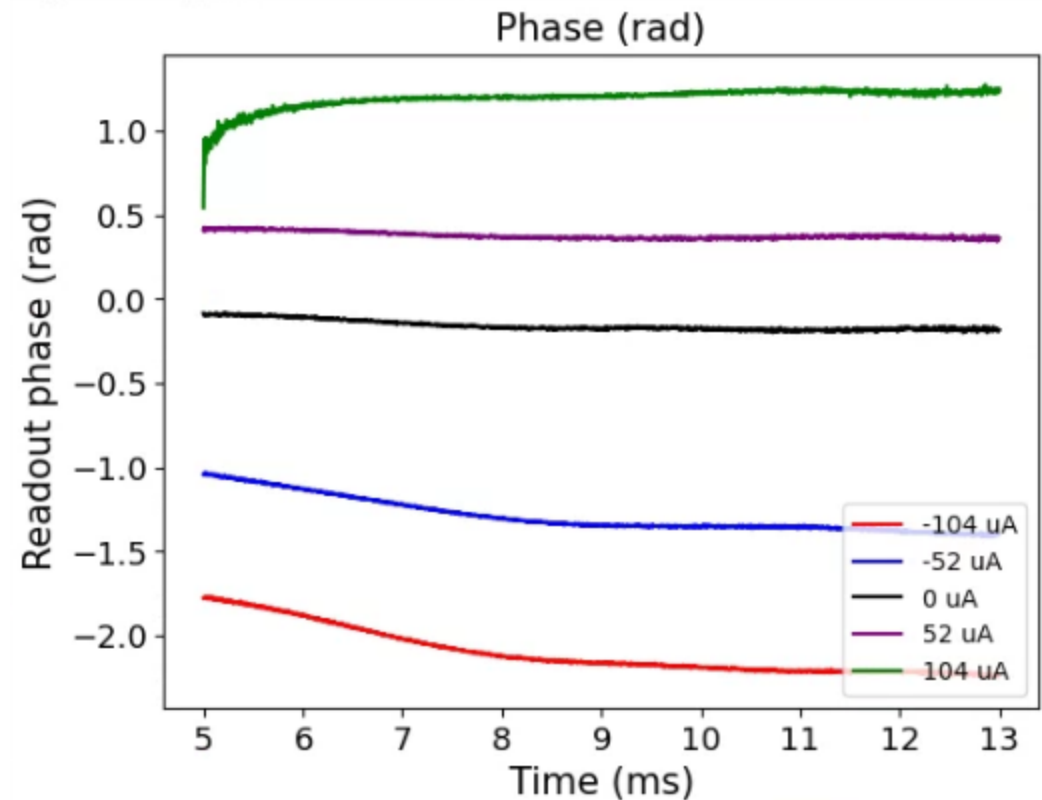
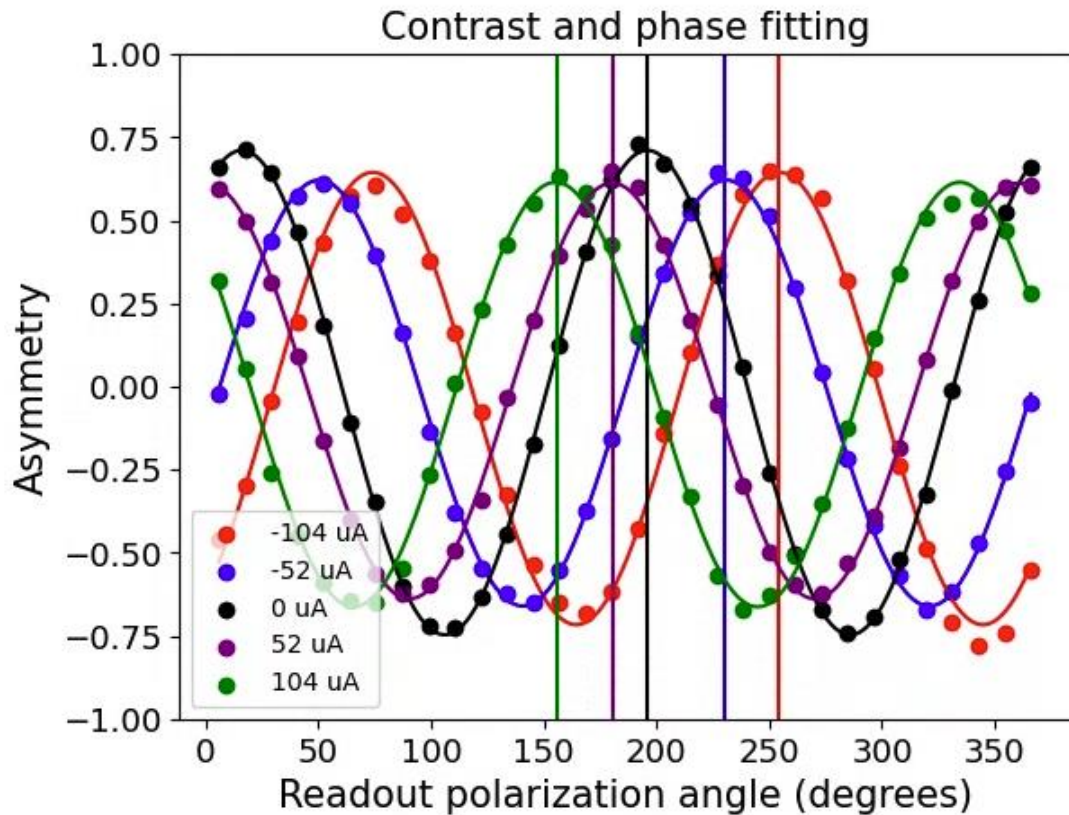
Transverse state prep

Sensitive only to time average of the B field

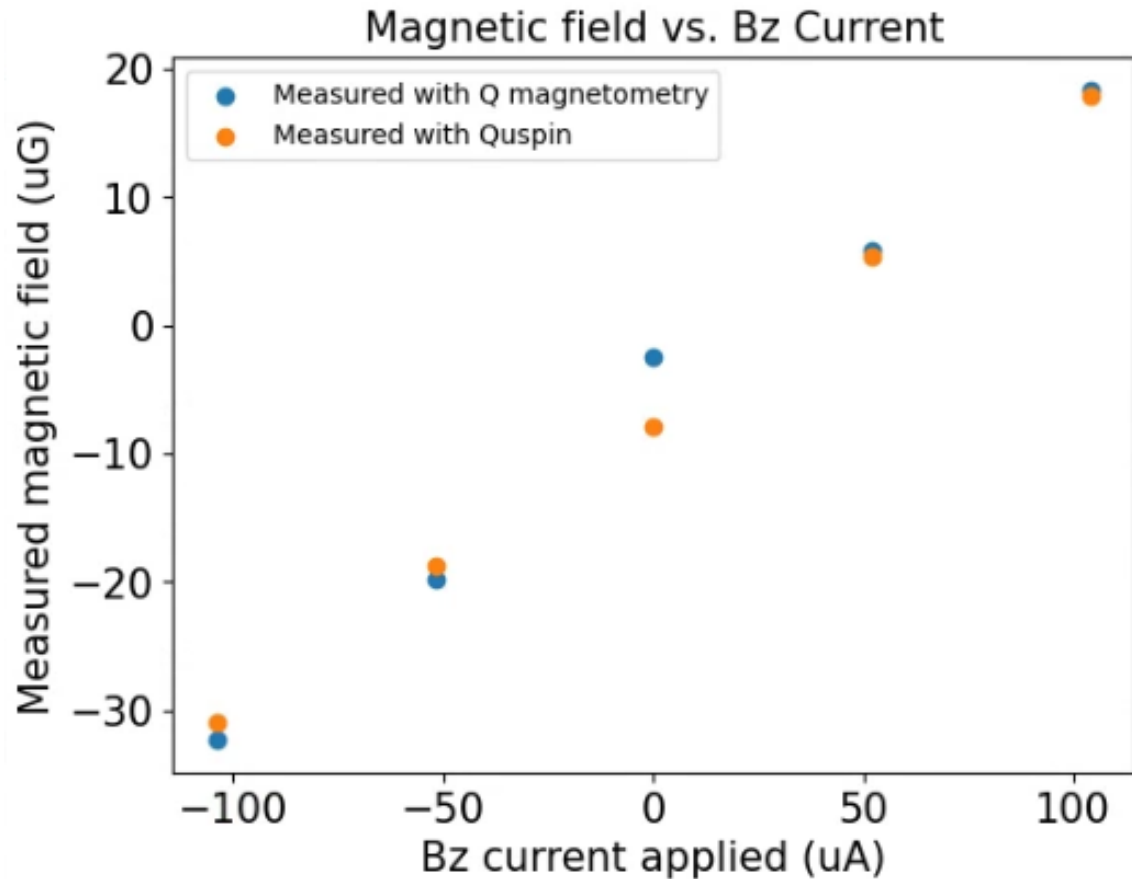


Variation of phase with applied Bz field

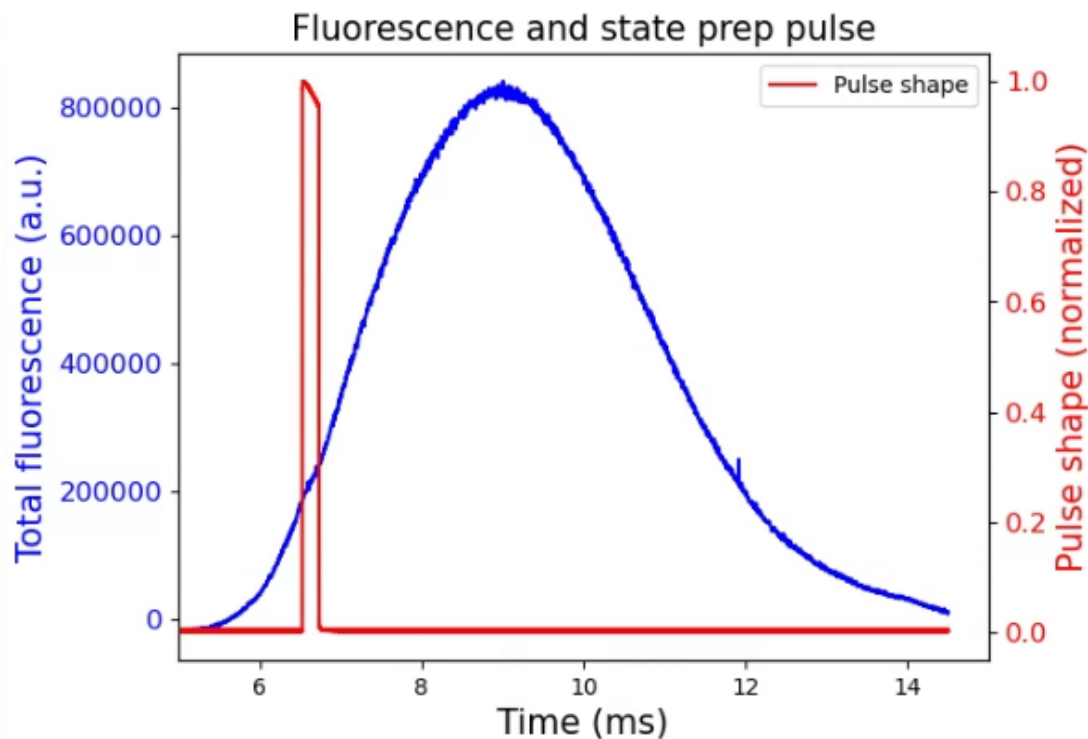
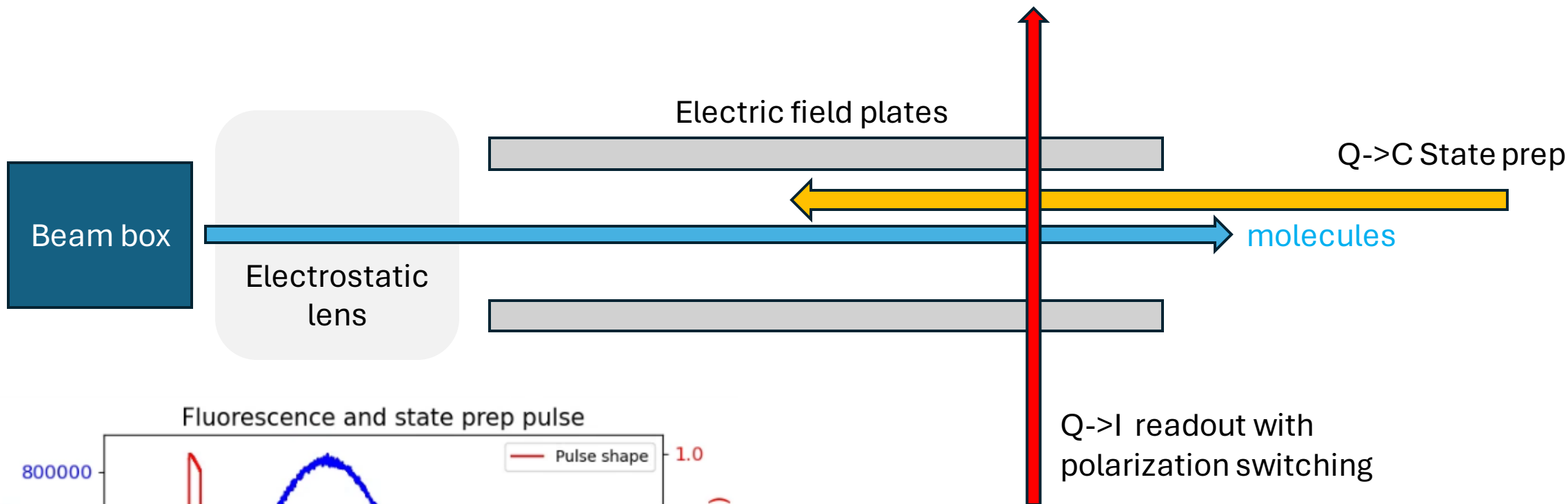
- Slope of phase is due to velocity dispersion: less time in B field = less phase accumulation
- Uneven jump from 0 uA to +/- 52 uA is due to current offset in Bz coil when activated/disabled by relay



Measured Bz vs. Applied current



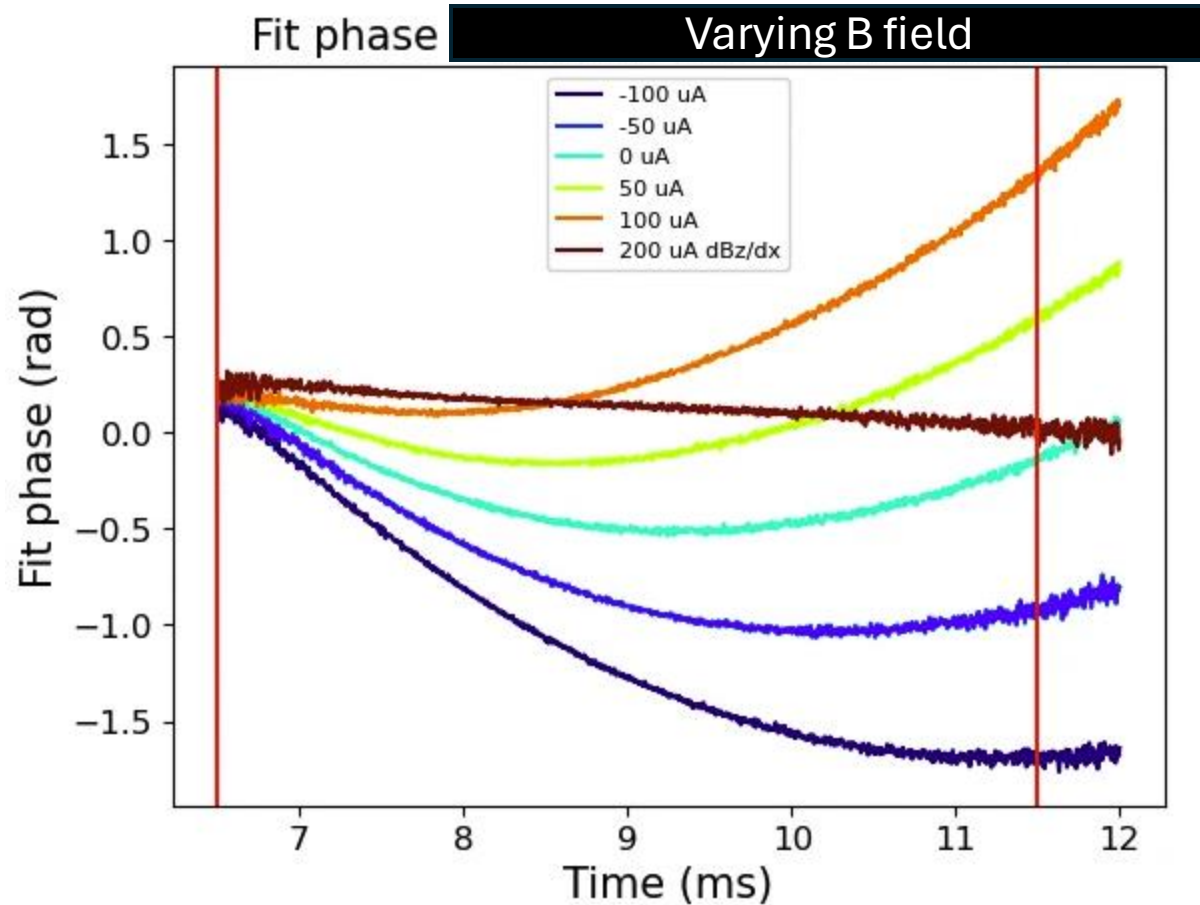
- Pretty good agreement between average of 4 Quspins and comagnetometry
- Only sensitive to **time-averaged B field in interaction region**



Longitudinal state prep

1. Initialize state with brief, strong longitudinal pulse
2. Readout phase as function of time

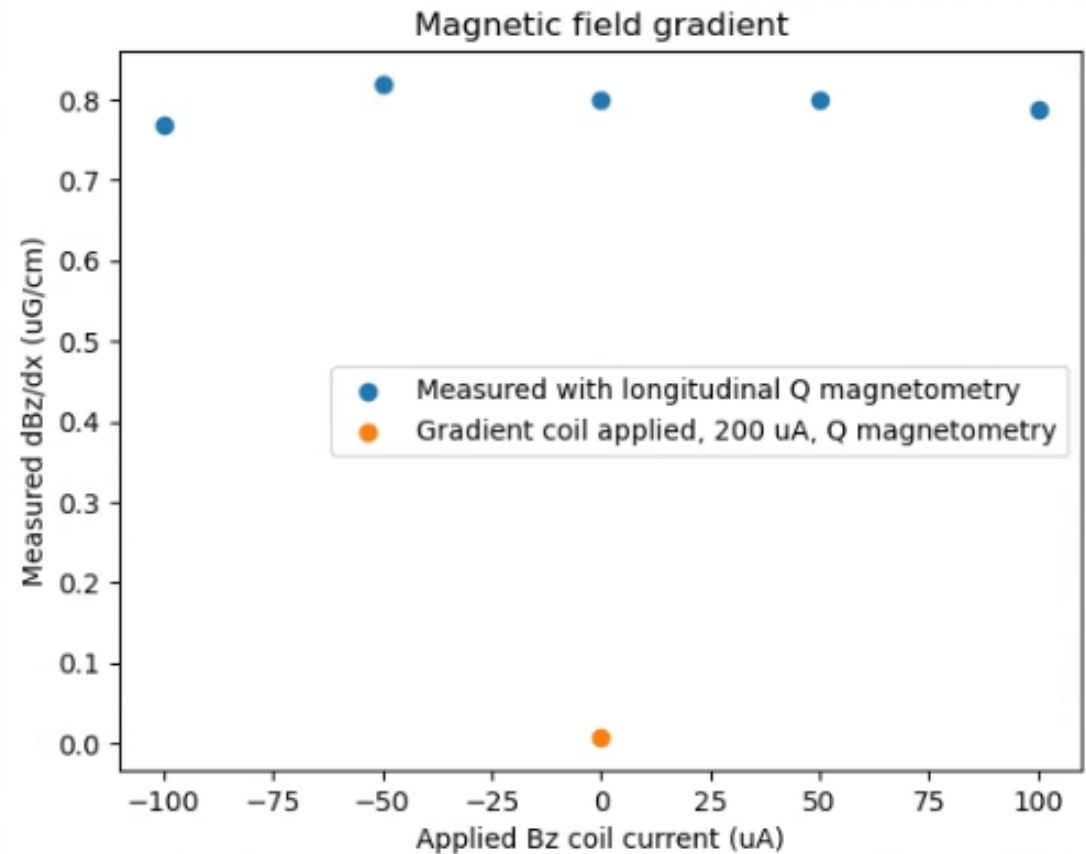
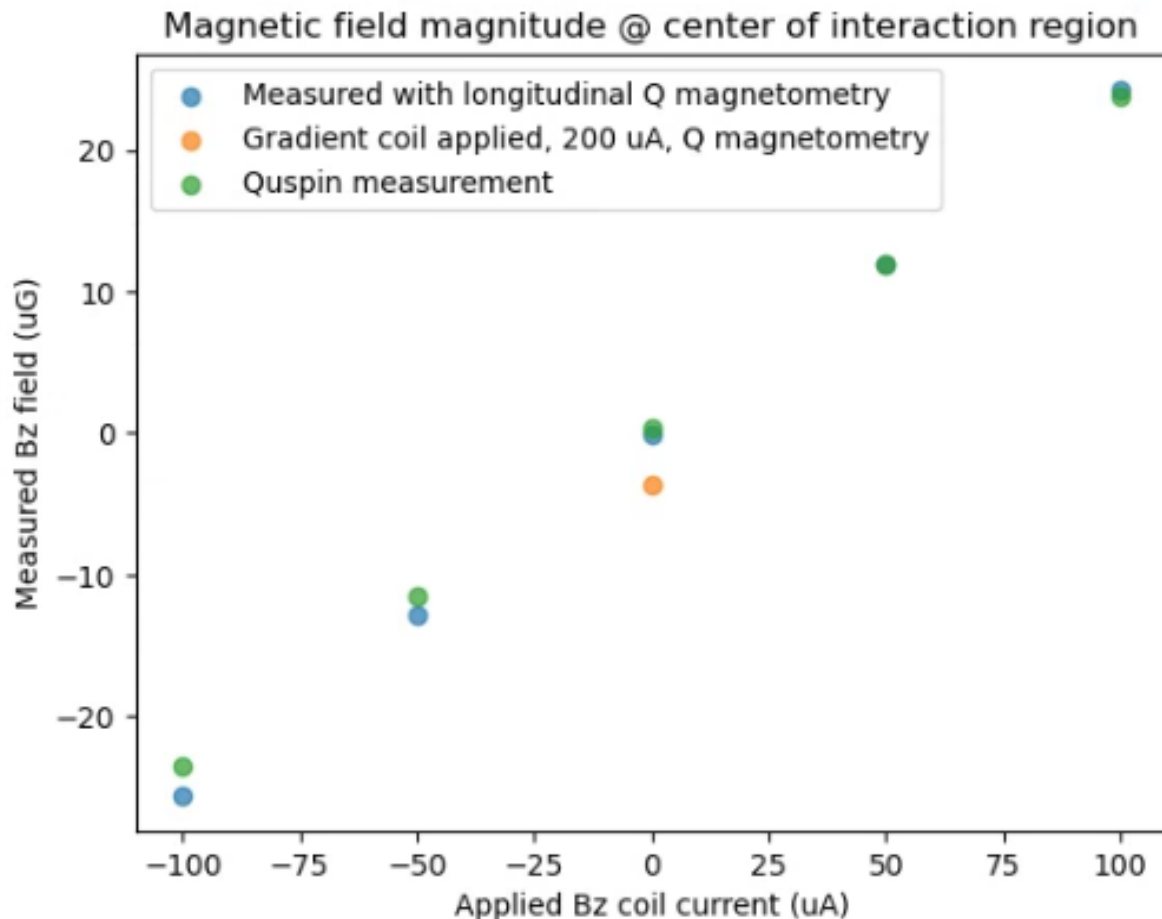
Readout phase as function of time

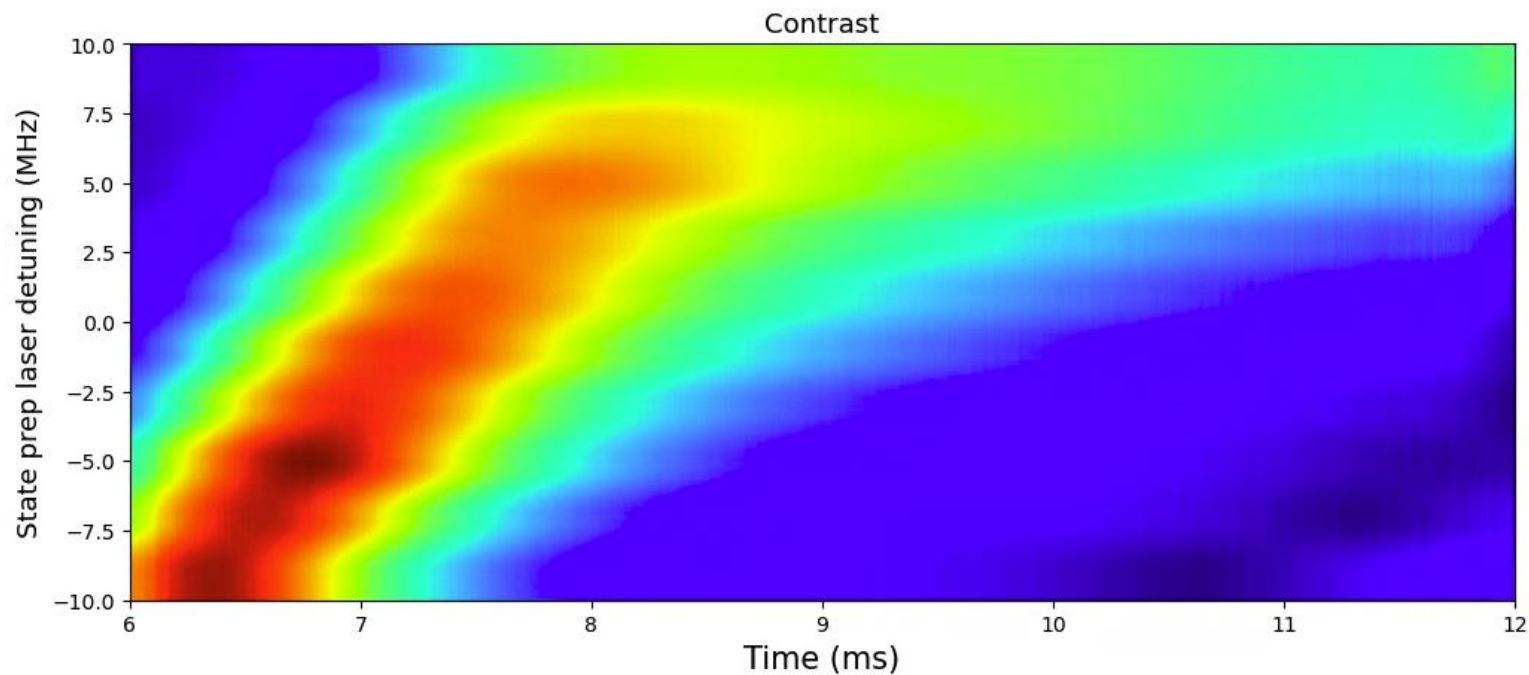
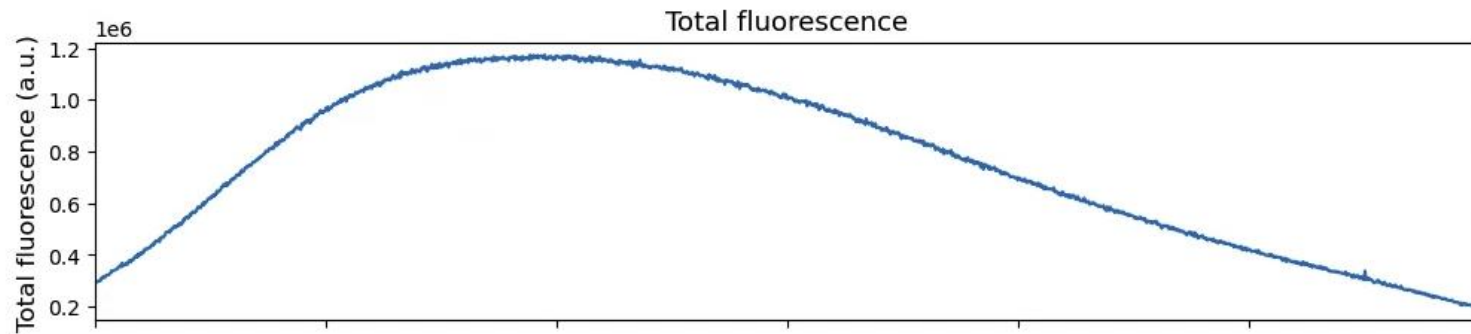


- B field is proportional to slope
- Linear phase = constant B_z
- Quadratic phase = constant dB_z/dx
- Measured phase as a function of time at 5 different applied B fields + applied dB_z/dx

Measured field with longitudinal state prep

- Still thinking through uncertainties (from velocity dispersion, etc.)





- Scan frequency of state prep laser to see longitudinal Doppler distribution
- Brief pocket of fast molecules at beginning of pulse with long, slower tail
- 1 MHz \sim 1.2 m/s