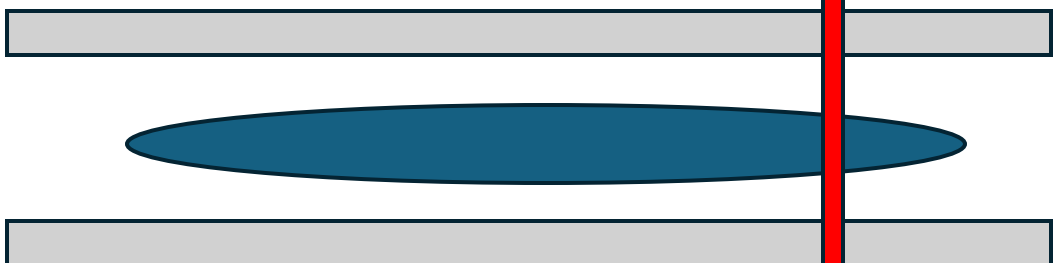


Raman Enr Measurement

- Last week, found a systematic error relating to the Raman pulse timing
- We believe we have partial explanation and have alternate scheme that should eliminate this error

15 ms delay time

Electric field plates

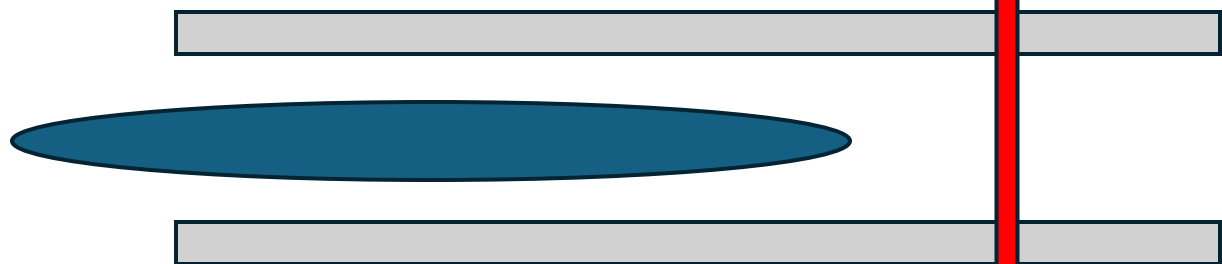


Q->I nm readout with polarization switching

Shorter Raman pulse delay time = prepare same molecules at position further upstream

13.5 ms delay time

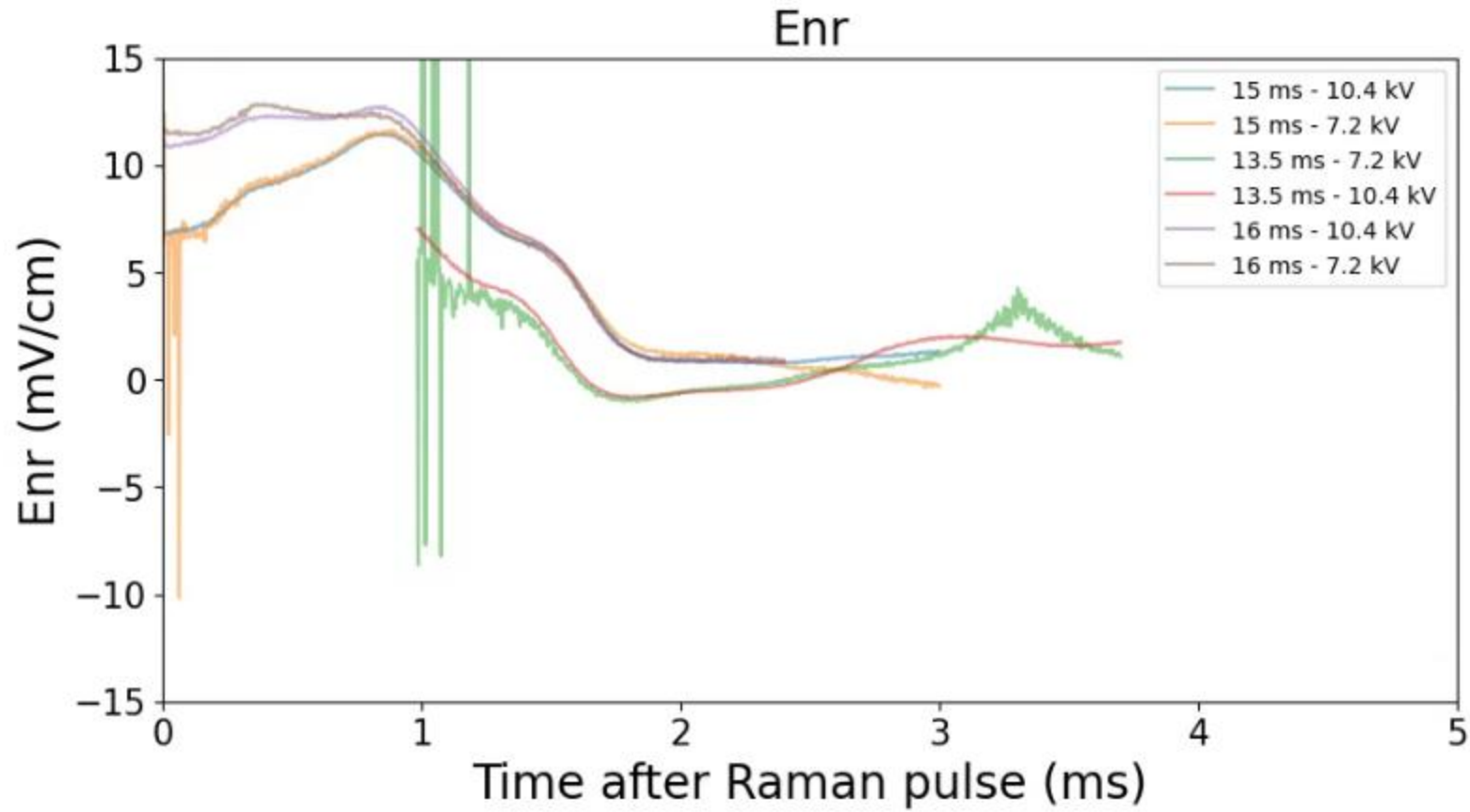
Electric field plates



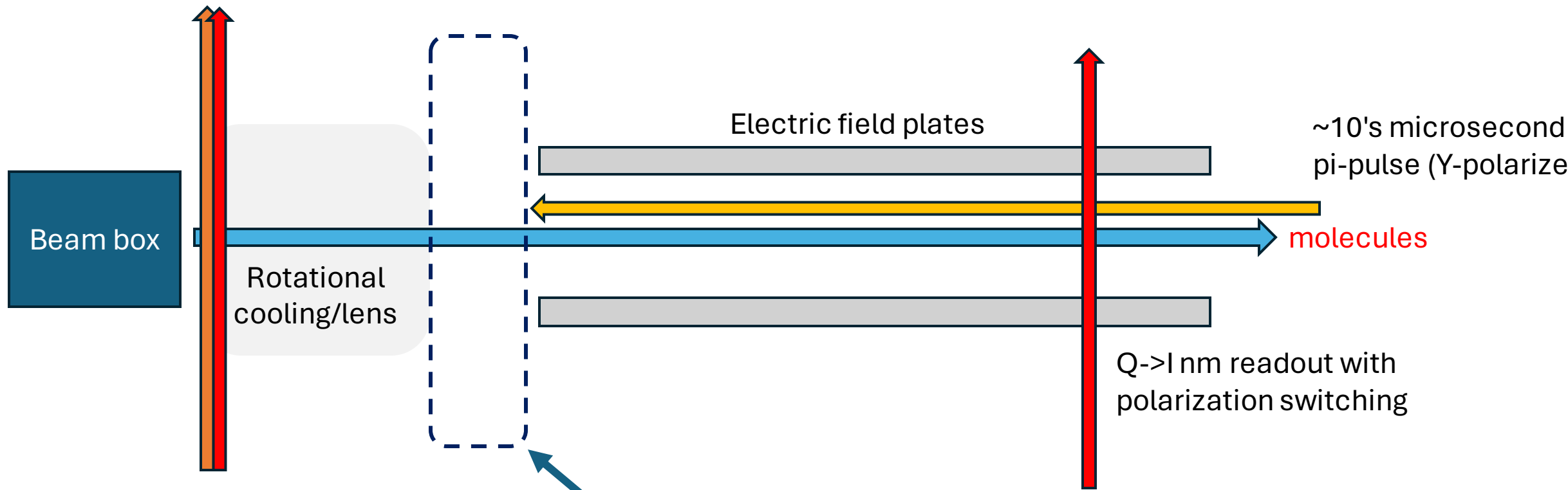
Q->I nm readout with polarization switching

To compare different delay times, look at time after Raman pulse for molecule preparation position

Not due to slight focusing from the lens



Current method of prep for comag/Enr



STIRAP I prepare
Q, $J=2$, $M=+2$

- Rely on some nonadiabatic transfer into Q, $M=+/-1$ between the lens and the interaction region
- Not a well-controlled process!
- No guarantee that populations transferred into $M=+/-1$ are identical

Observe some apparent E-correlated Rabi frequency

$$\Omega_{\text{raman}} = \frac{\Omega_1 \Omega_2}{2\Delta}$$

Hard to imagine a model gives rise to E correlated one-photon rabi frequency (laser power is constant)

But if there's some velocity selection in the transfer to $M=\pm 1$, the one photon detuning may have some E correlation

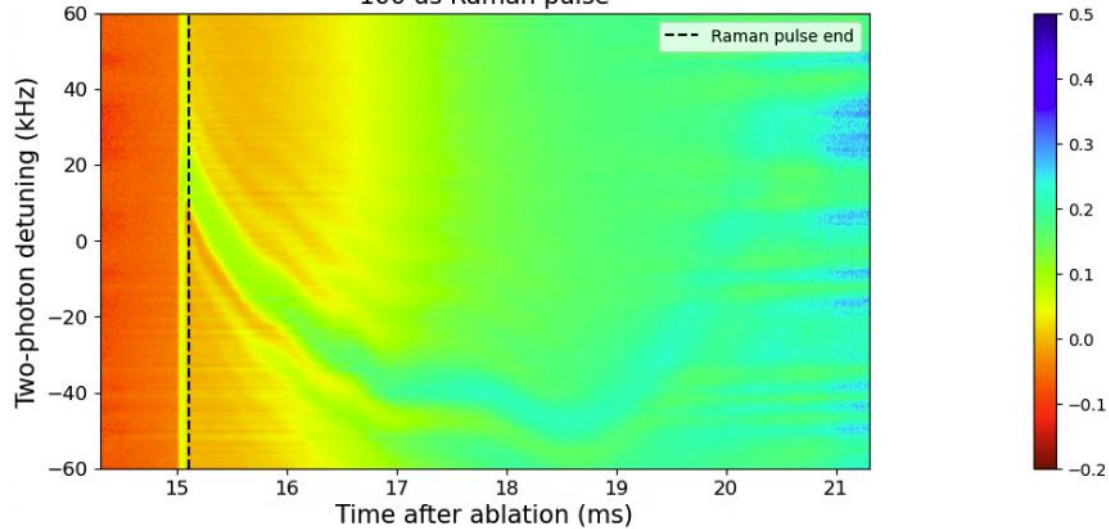
If there's some spin-quadrature specific v^E , the measurement scheme no longer works (time of flight isn't consistent measure of distance)

Asymmetry vs. time and two-photon detuning

First set

LE=11

Transverse prep on
100 us Raman pulse

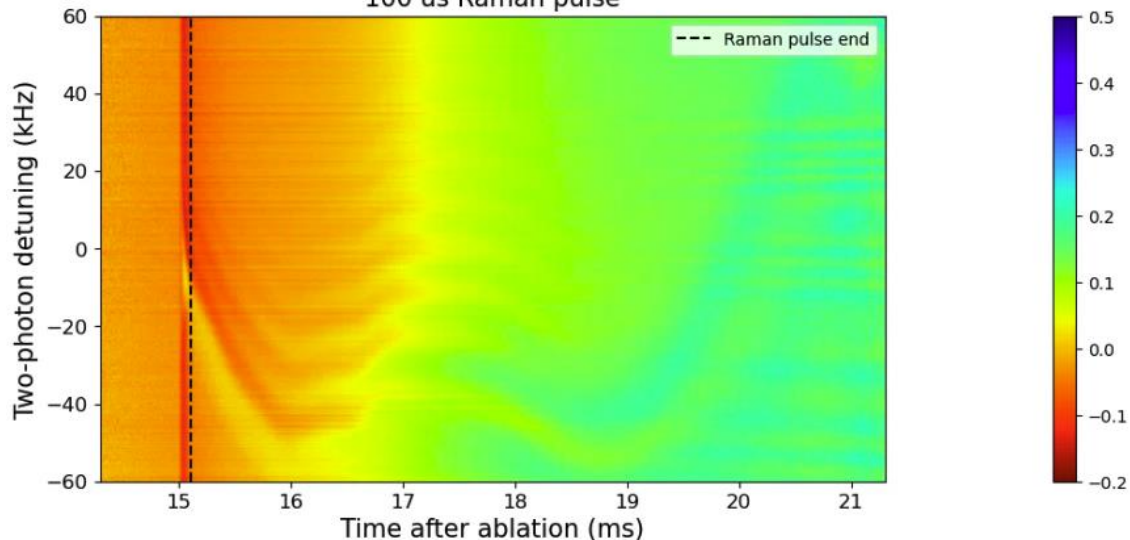


Asymmetry vs. time and two-photon detuning

First set

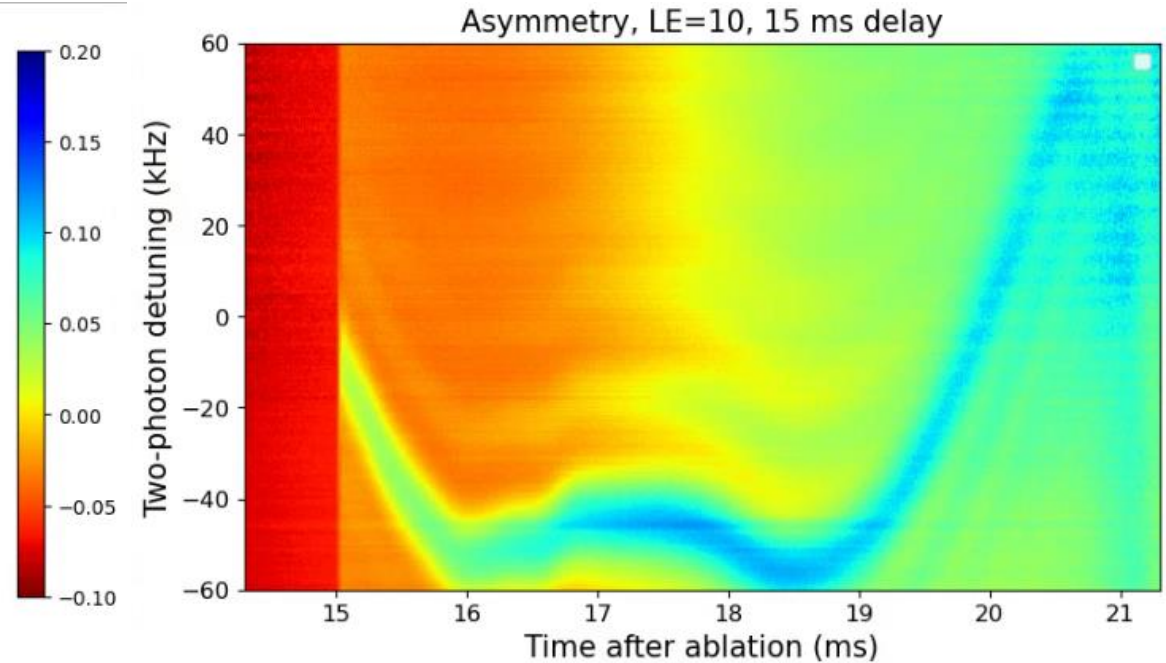
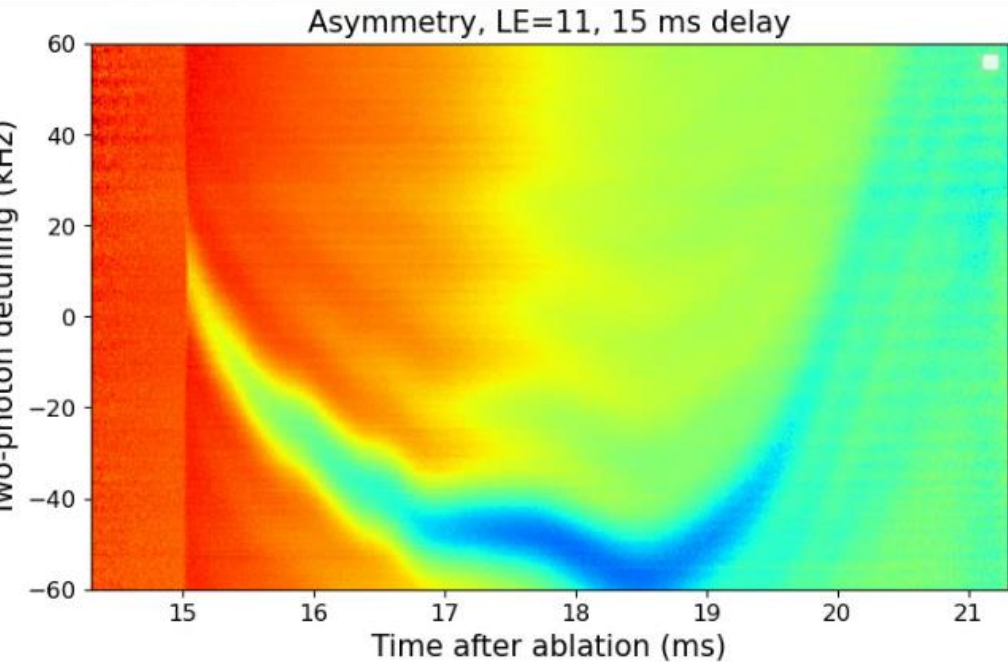
LE=10

Transverse prep on
100 us Raman pulse



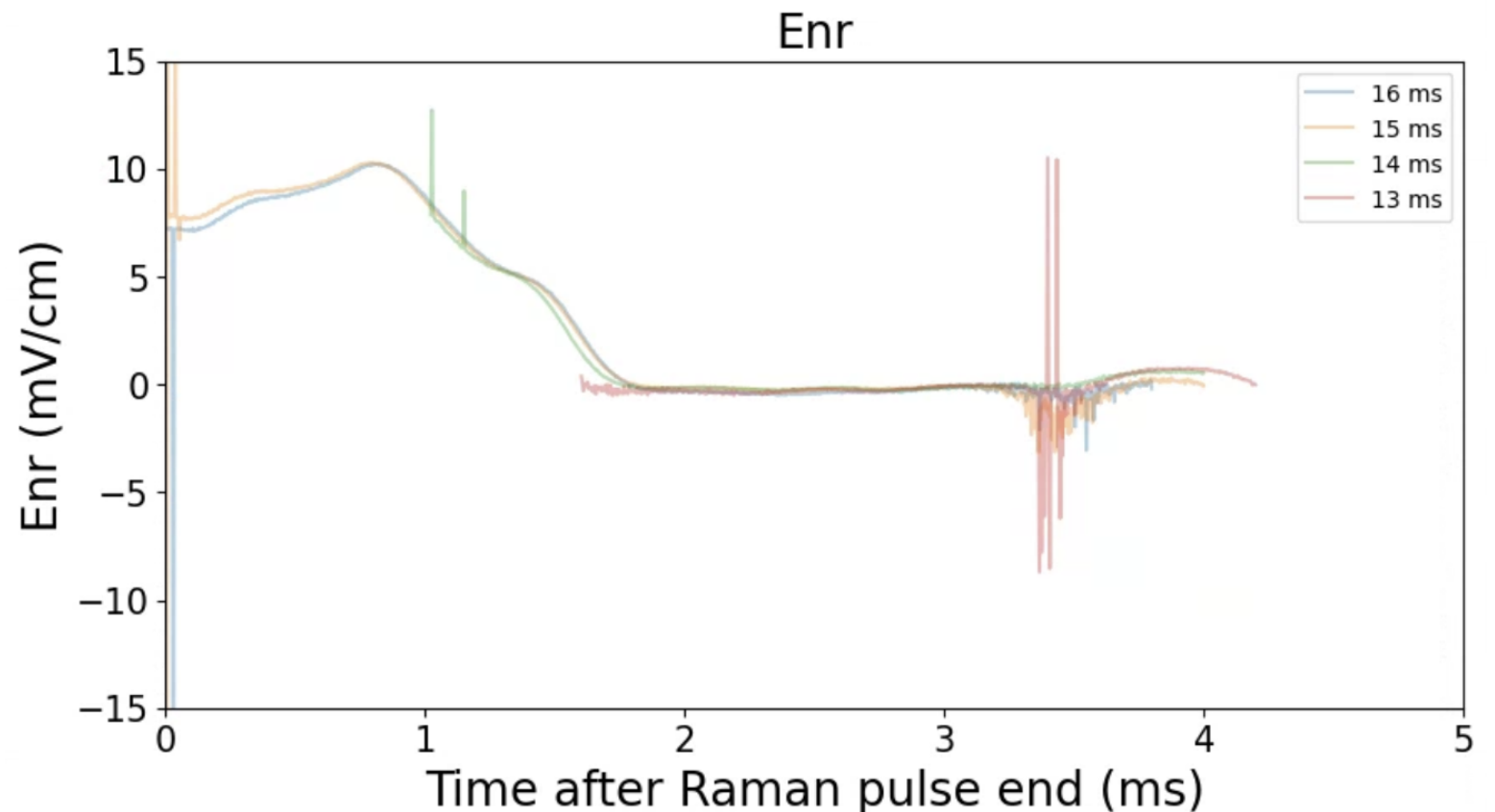
Attempt to improve

- Prepare Q, $M=+/-2$ at first lens STIRAP
- Provide greater symmetry in reaching $M=+/- 1$



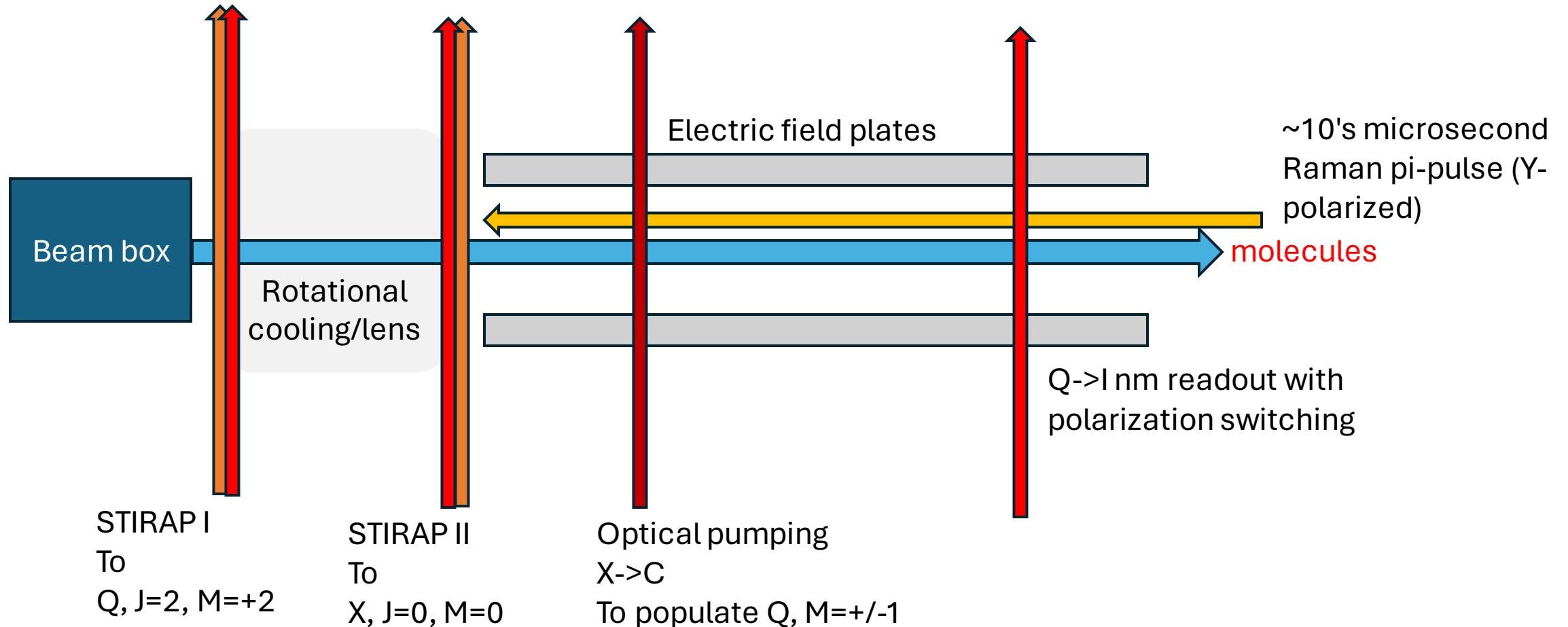
Enr estimate after changing STIRAP

- Much smaller discrepancy (<1 mV/cm) that can mostly be explained by varying velocity within the beam



Better way to prep for comag/Enr

Prepare initial state by transferring back to X, $J=0$, $M=0$ and then optically pumping into Q, $J=2$, $M=+/-2$ with vertical STIRAP



Plan for next few weeks

- Try with current setup to get idea of E_{nr} near prep
- Setup 2nd lens STIRAP and vertical STIRAP to get population in H state
- Repeat E_{nr} measurements with improved Raman scheme, and double check with microwave measurement in H
- Explicitly measure systematic slope $\frac{\partial \omega^{N\mathcal{E}}}{\partial E^{nr}}$