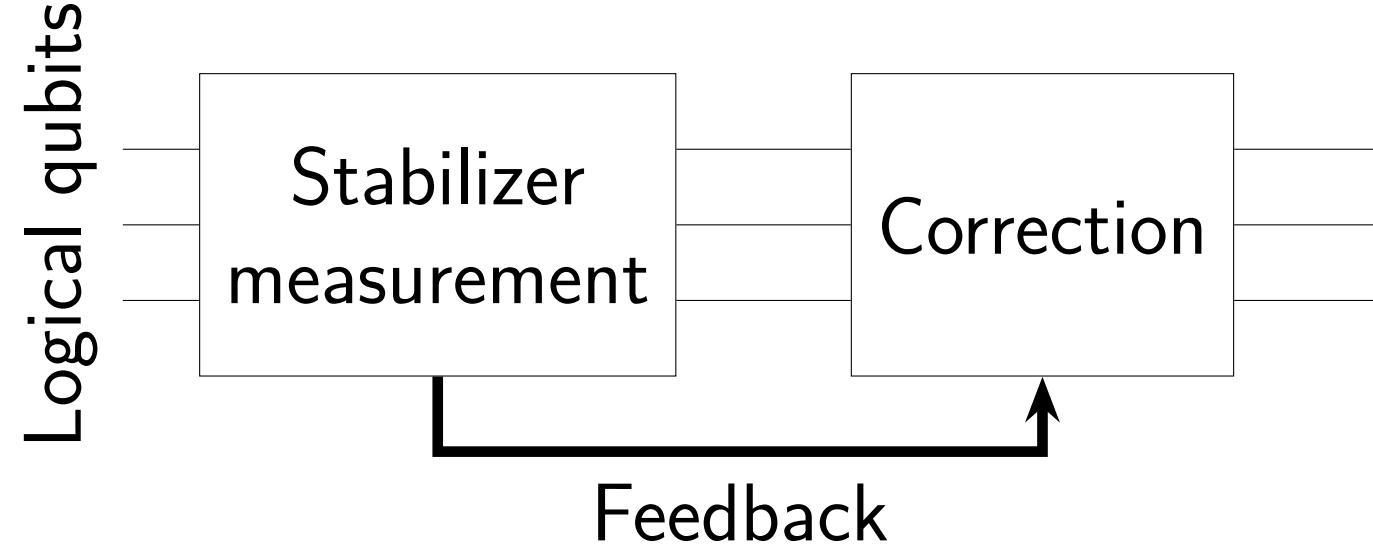


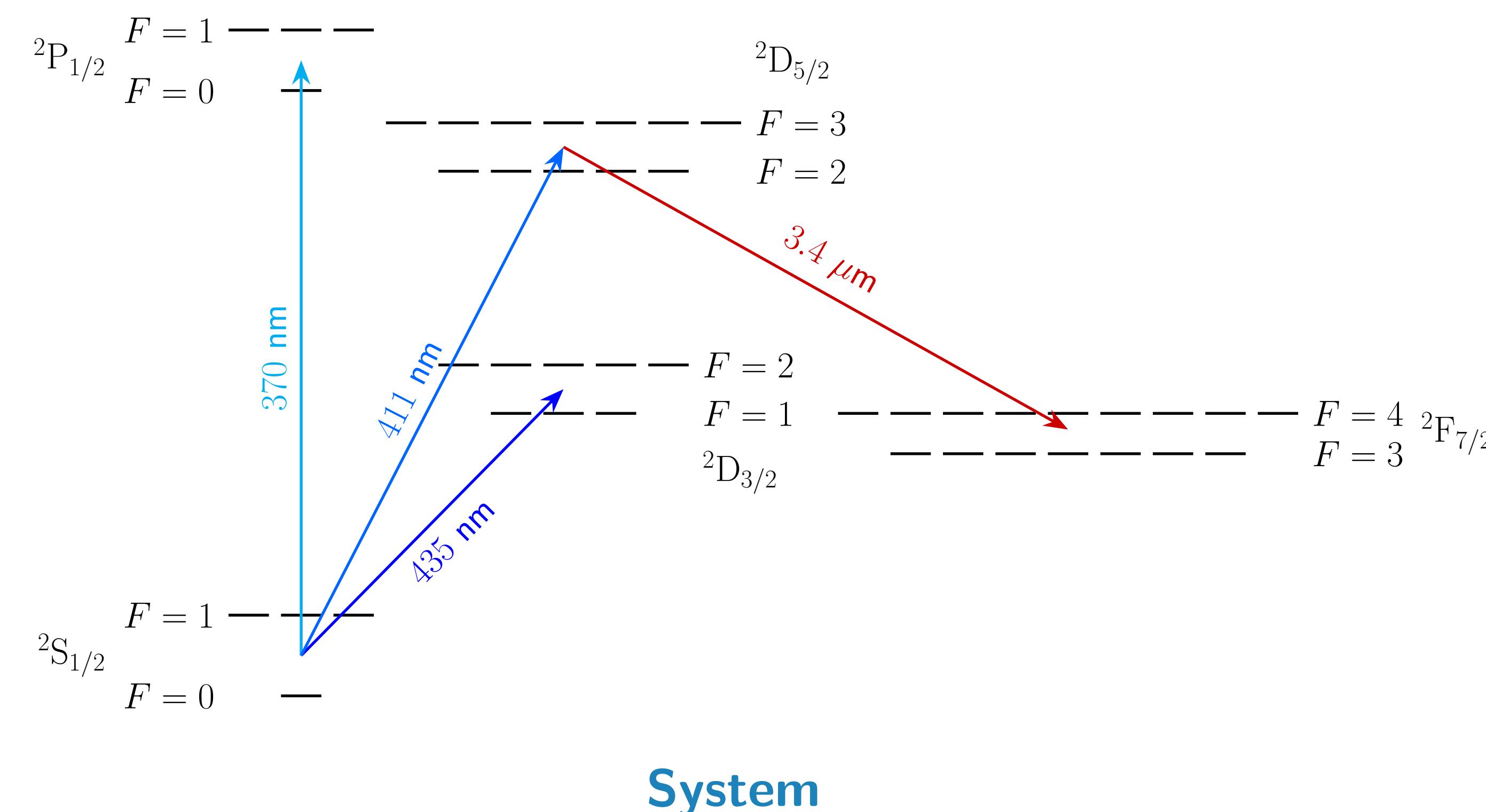
Mid-circuit measurement and the *omg* architecture

## Mid-circuit measurement

- Required for multiple rounds of error correction
- Partial readout without perturbing the rest of the system

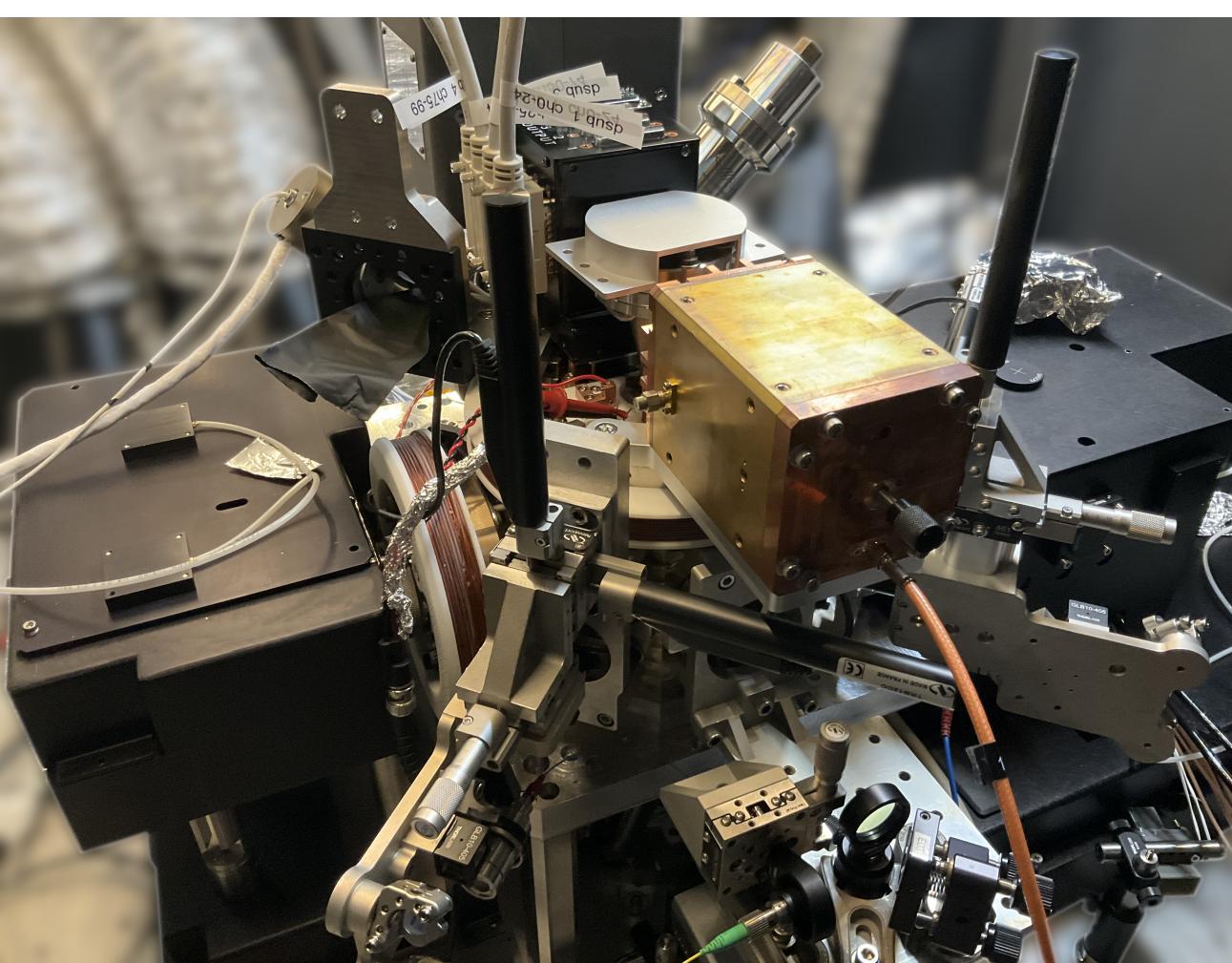
*omg* architecture

- Combining **O**ptical **M**etastable and **G**round state qubits
- Protecting quantum information by converting between qubit types
- Faster than ion-shuttling

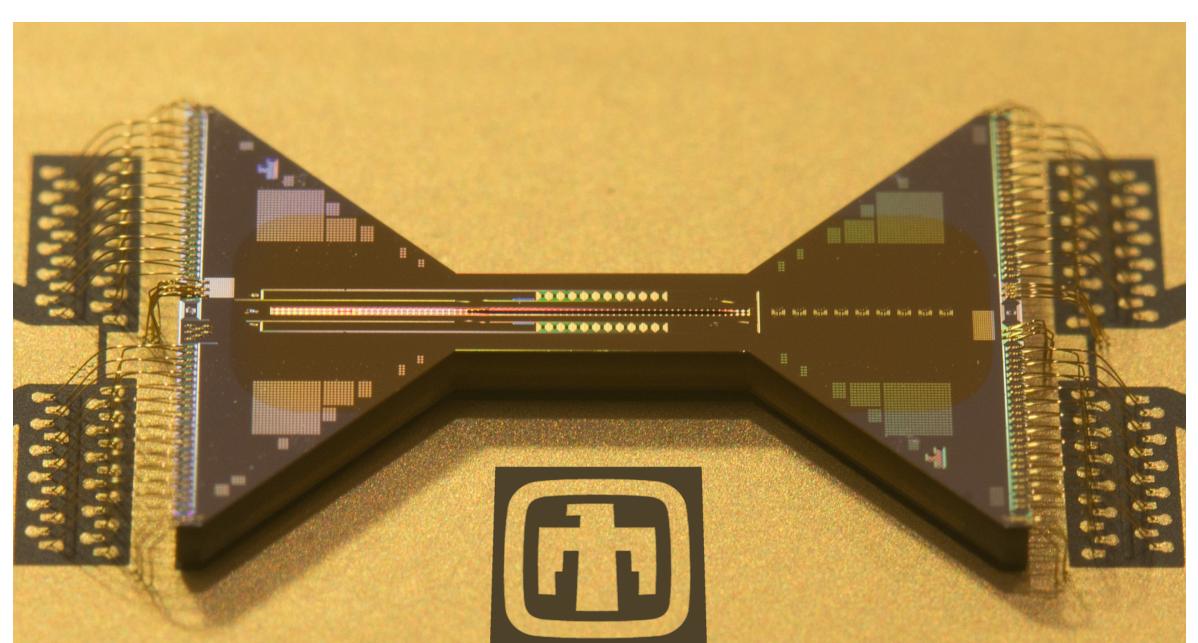


## Optical control

- Global state preparation and detection with 370 nm
- Individually addressable Raman with 355 nm
- Global 435 nm for exciting to  $D_{3/2}$  states
- (Planned) Global 411 nm and 3.4  $\mu\text{m}$  for accessing  $D_{5/2}$  and  $F_{7/2}$  states

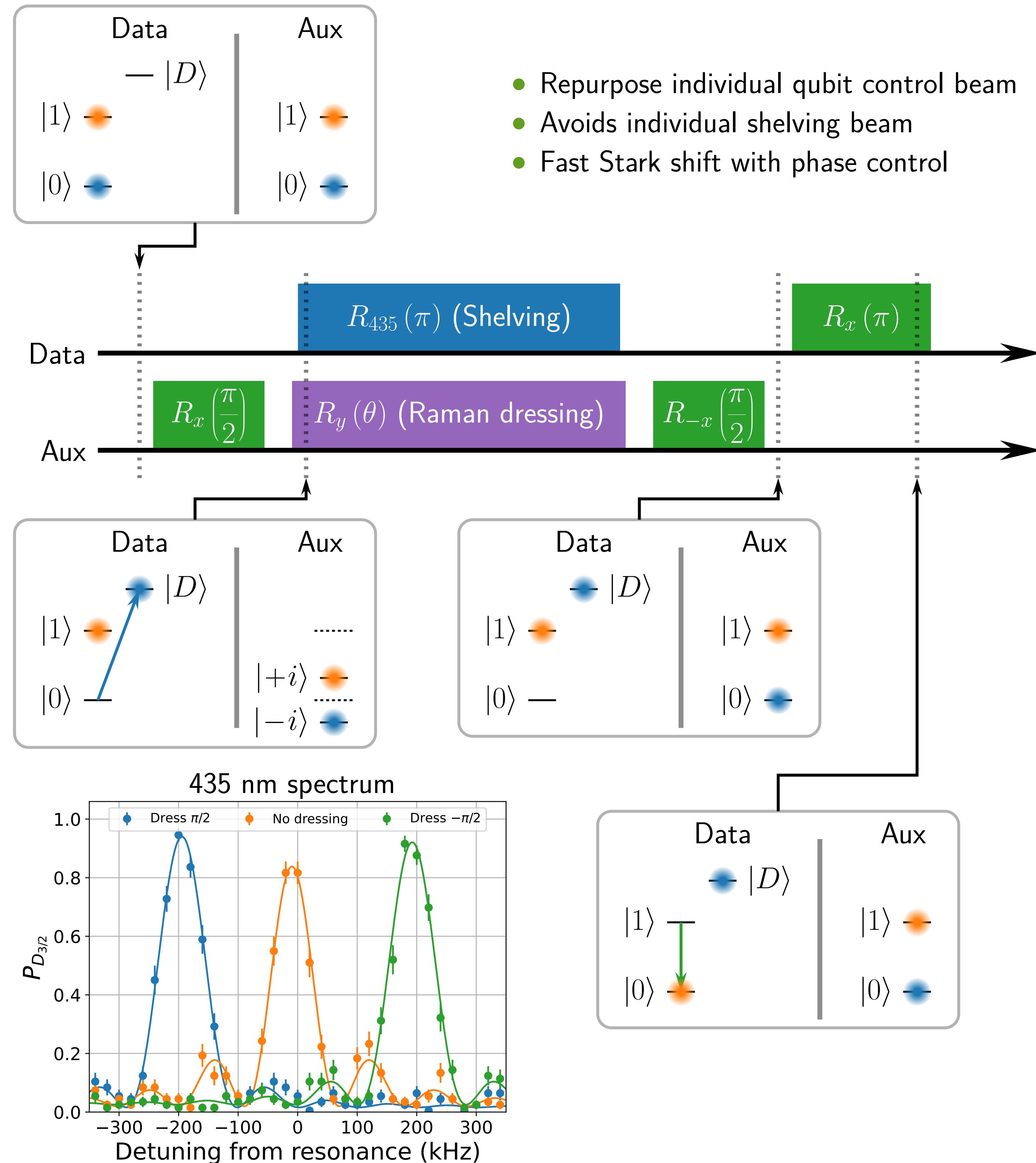


## Phoenix surface trap



- Separate loading and quantum region
- Fine control of ion position
- Low heating rate

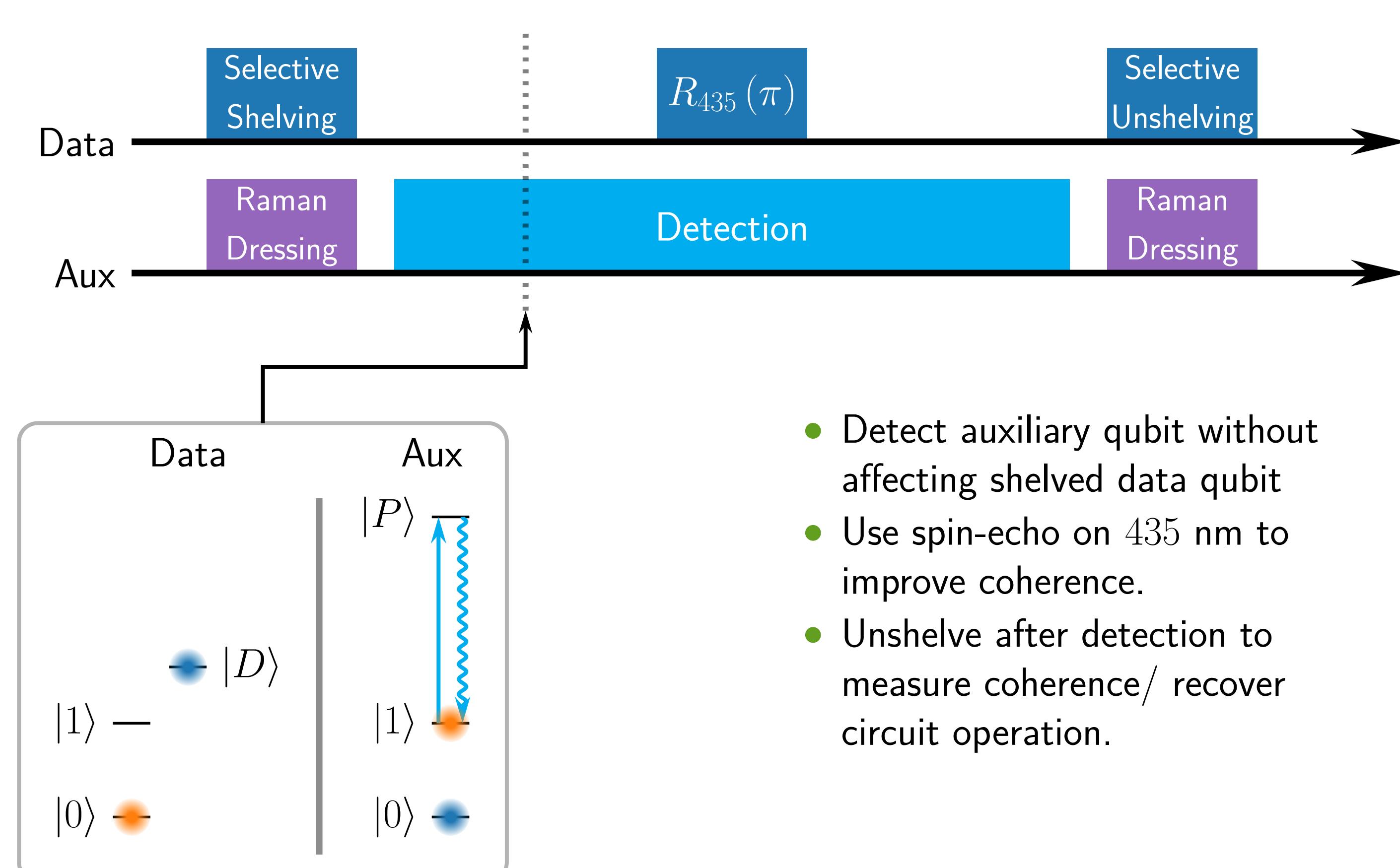
## Selective shelving with Raman dressing



## Preliminary results

## Future works

## Mid circuit measurement with selective shelving



- Detect auxiliary qubit without affecting shelved data qubit
- Use spin-echo on 435 nm to improve coherence.
- Unshelve after detection to measure coherence/ recover circuit operation.