

# Mid-circuit measurement and reset using *omg* architecture in trapped-ion quantum computing systems

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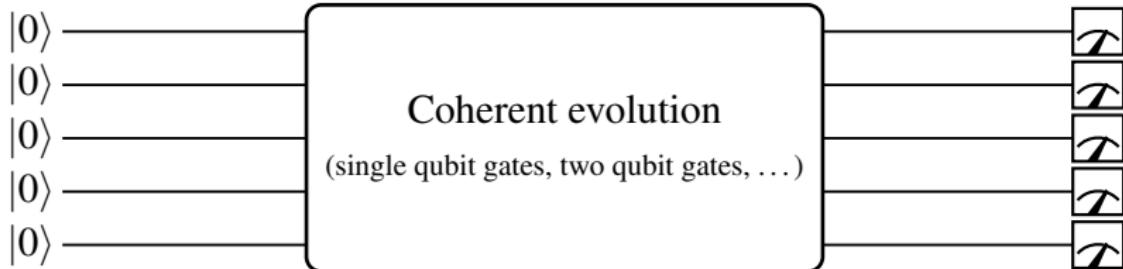


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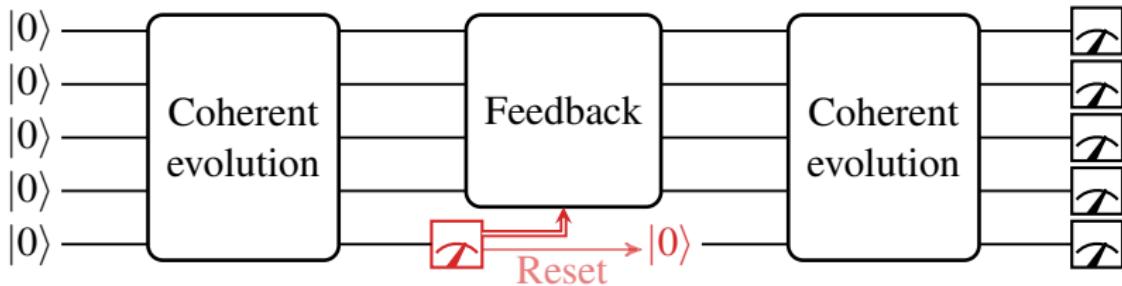
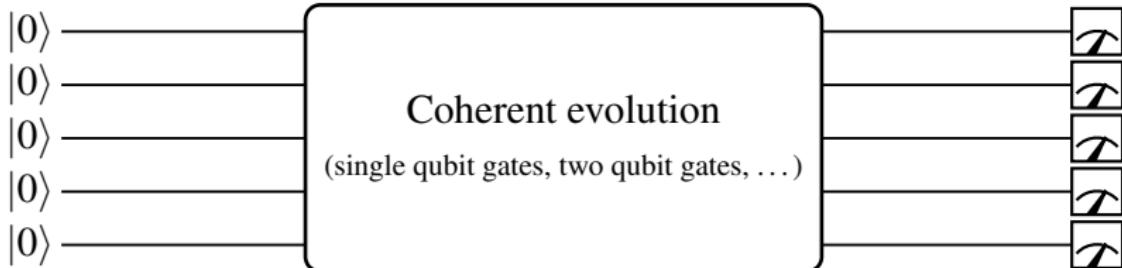




## Mid-circuit measurement and reset (MCMR)



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## MCMR in ions

- Shuttling
- Multi-species
- Metastable states  
*omg-architecture*

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## MCMR in ions

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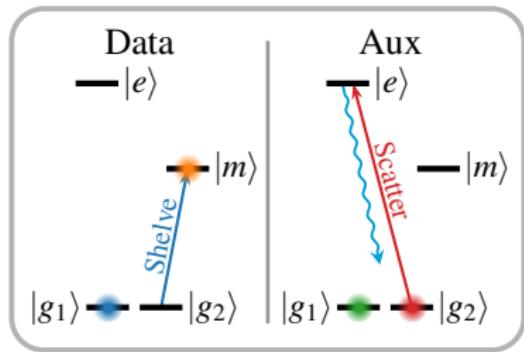
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## MCMR in ions

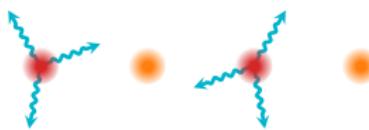
- Shuttling
- Multi-species
- Metastable states
- *omg*-architecture

- Yb:  $D_{3/2}$ ,  $D_{5/2}$ ,  $F_{7/2}$
- Ba:  $D_{3/2}$ ,  $D_{5/2}$
- Sr:  $D_{3/2}$ ,  $D_{5/2}$

# MCMR with metastable state — shelving method

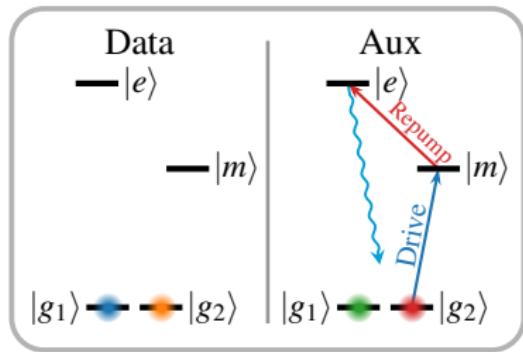


Individual Shelfe



Aux Data Aux Data

# MCMR with metastable state — hands-off method

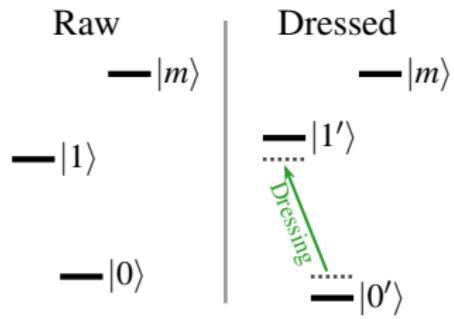


Individual Drive

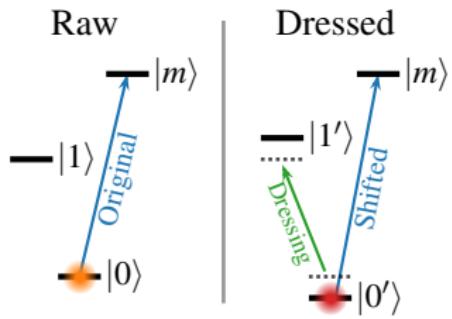


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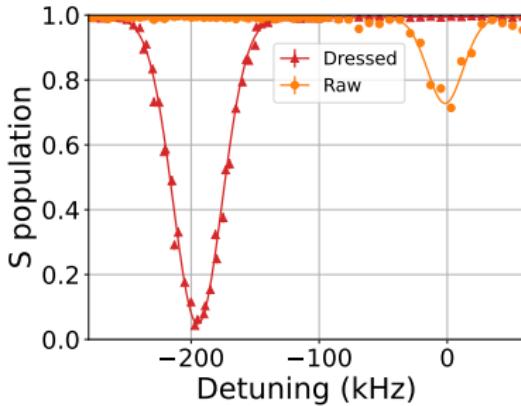
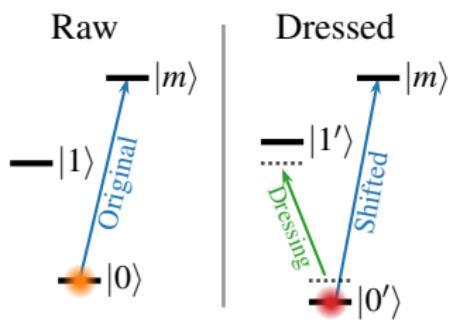
## Individual control of metastable state — dressing



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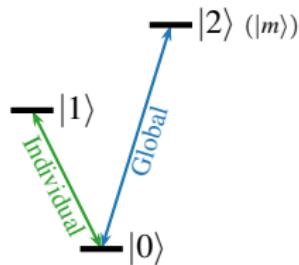


# Individual control of metastable state — dressing



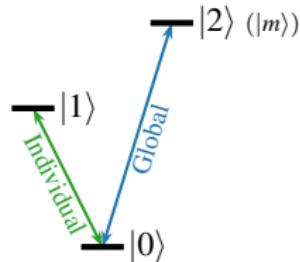
# Individual control of metastable state

## Individual qudit control

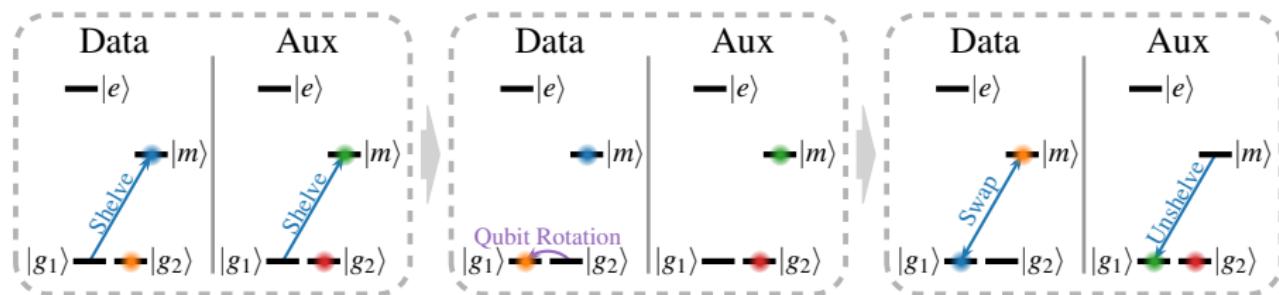


# Individual control of metastable state — qubit rotation

## Individual qudit control

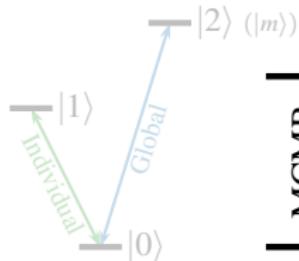


## Example Sequence



# Individual control of metastable state

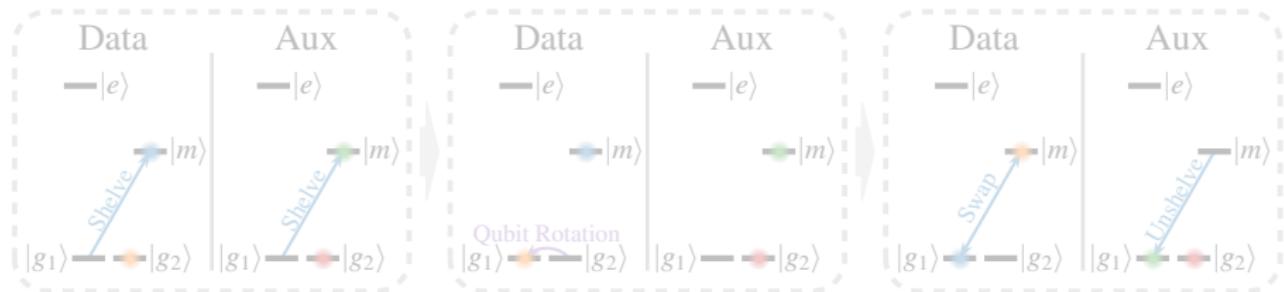
Individual qudit control



Individual metastable control

	Dressing	Qubit rotation
MCMR methods		
Shelving	✓	✓
Hands-off	✓	✗

Example Sequence







Christopher R Monroe



Alexander Kozhanov



Crystal Noel



Keqin Yan



Vivian Zhang



Debopriyo Biswas



Bahaa Harraz



