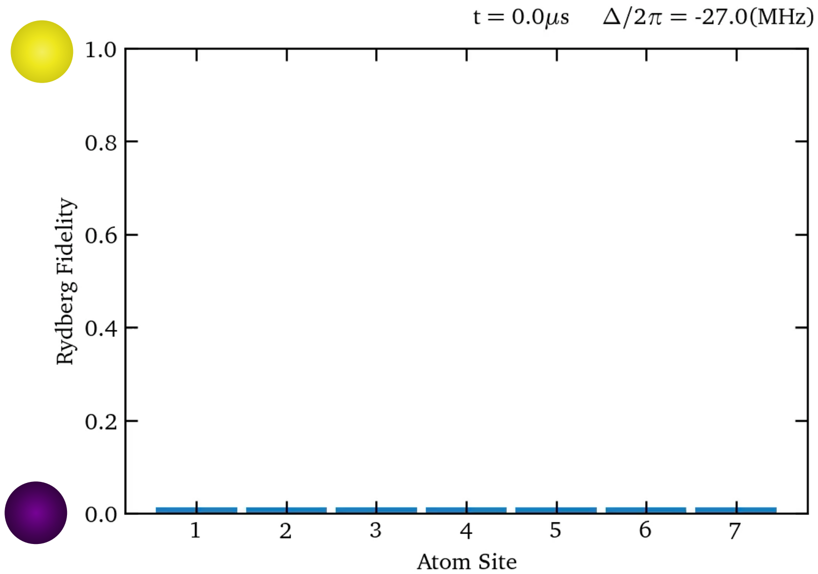
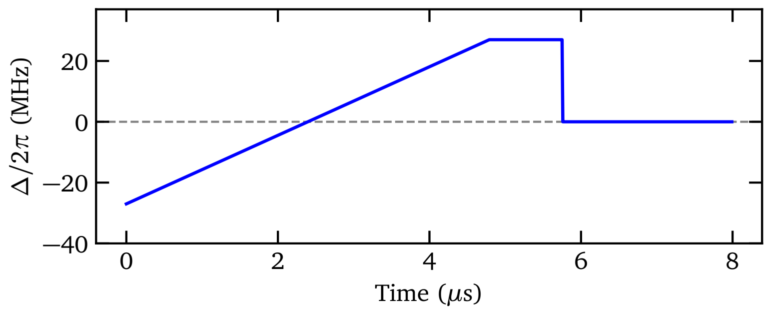
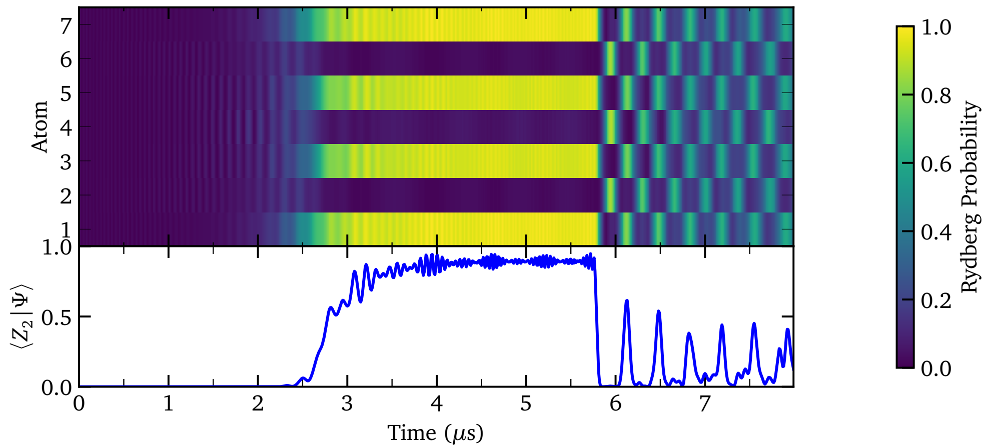
Adiabatic Sweep + Global Quench





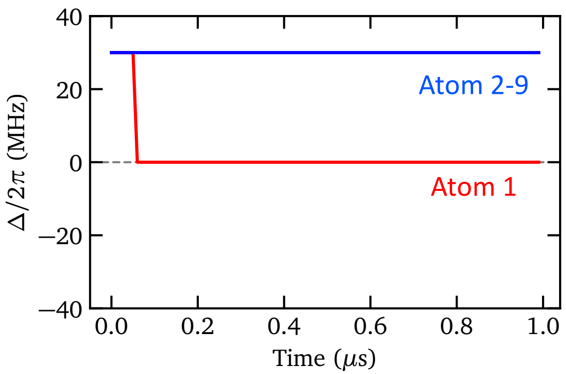


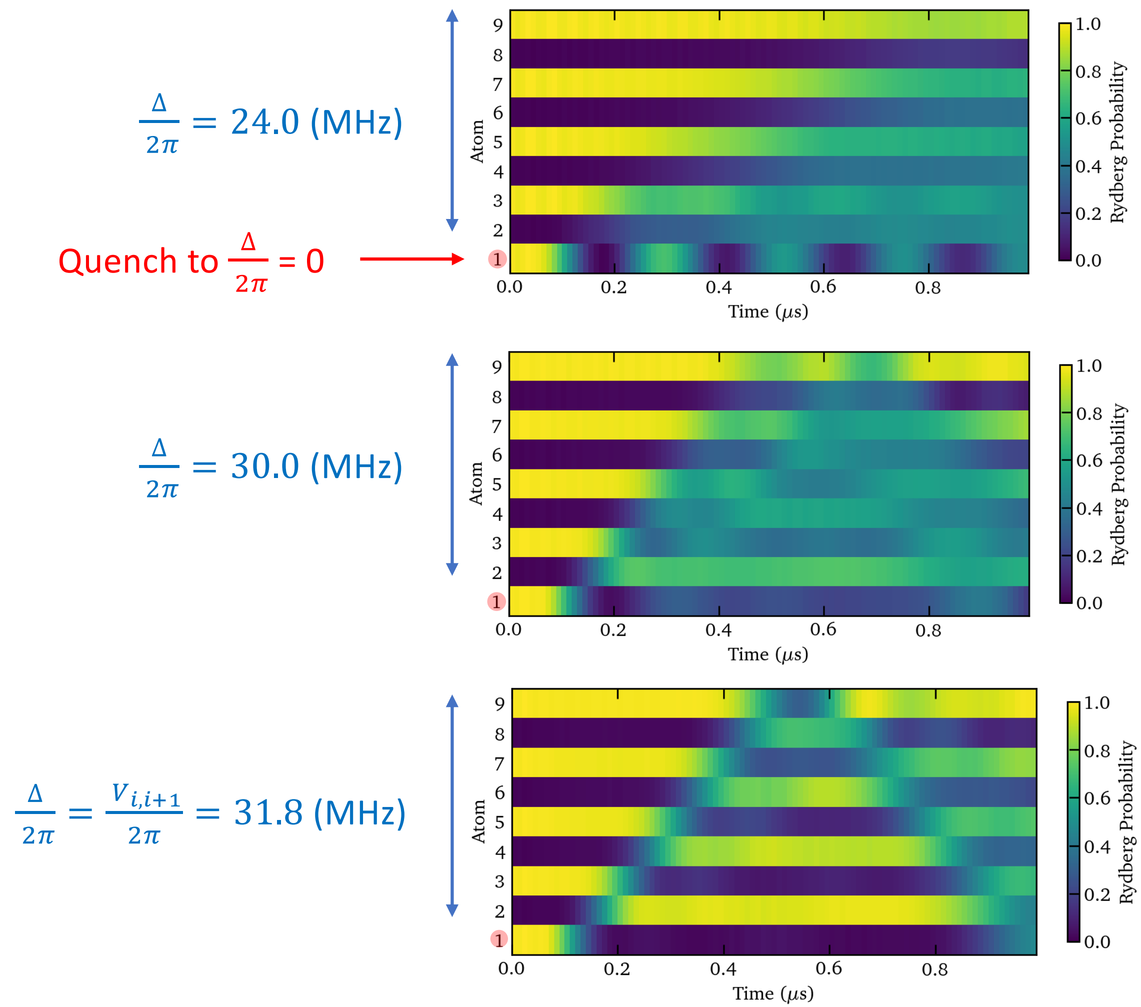
Local Quenching

- Atoms initially set in $\mathbb{Z}_2$ state
- Quench atom 1 at t $= \ 0.05\ \mu s$
- Rabi frequency is constant:

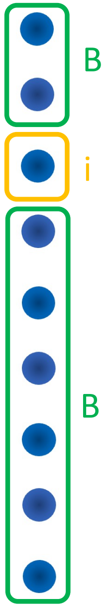
  $\Omega(t)/\ 2\pi\ = 4.00$ (MHz)
- Nearest Neighbor interaction:

  $\boldsymbol{V_{i,i+1}\ /\ 2\pi\ =\ 31.8}$ **(MHz)**



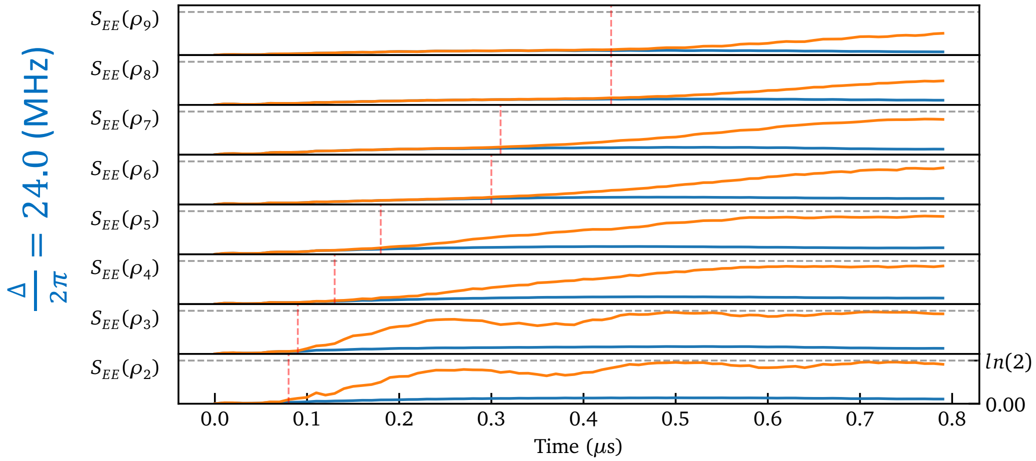


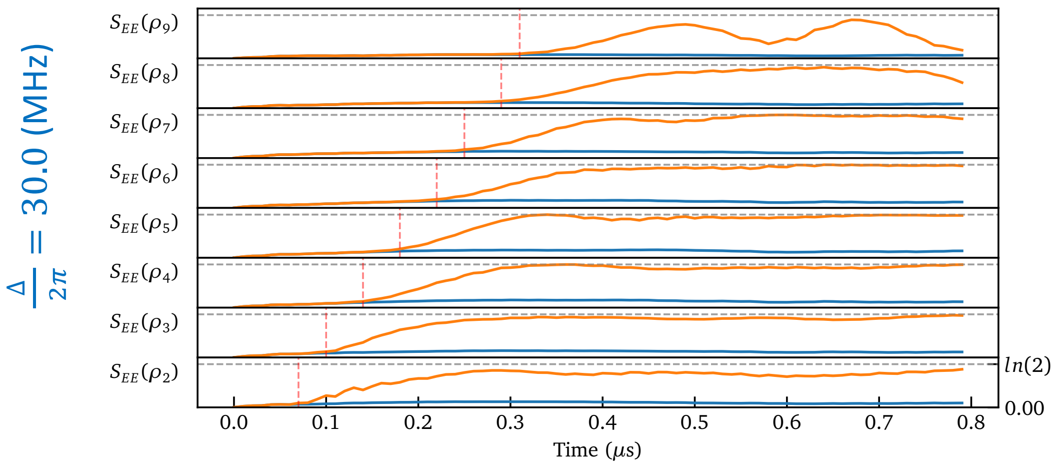
Local Quenching: Entanglement entropy



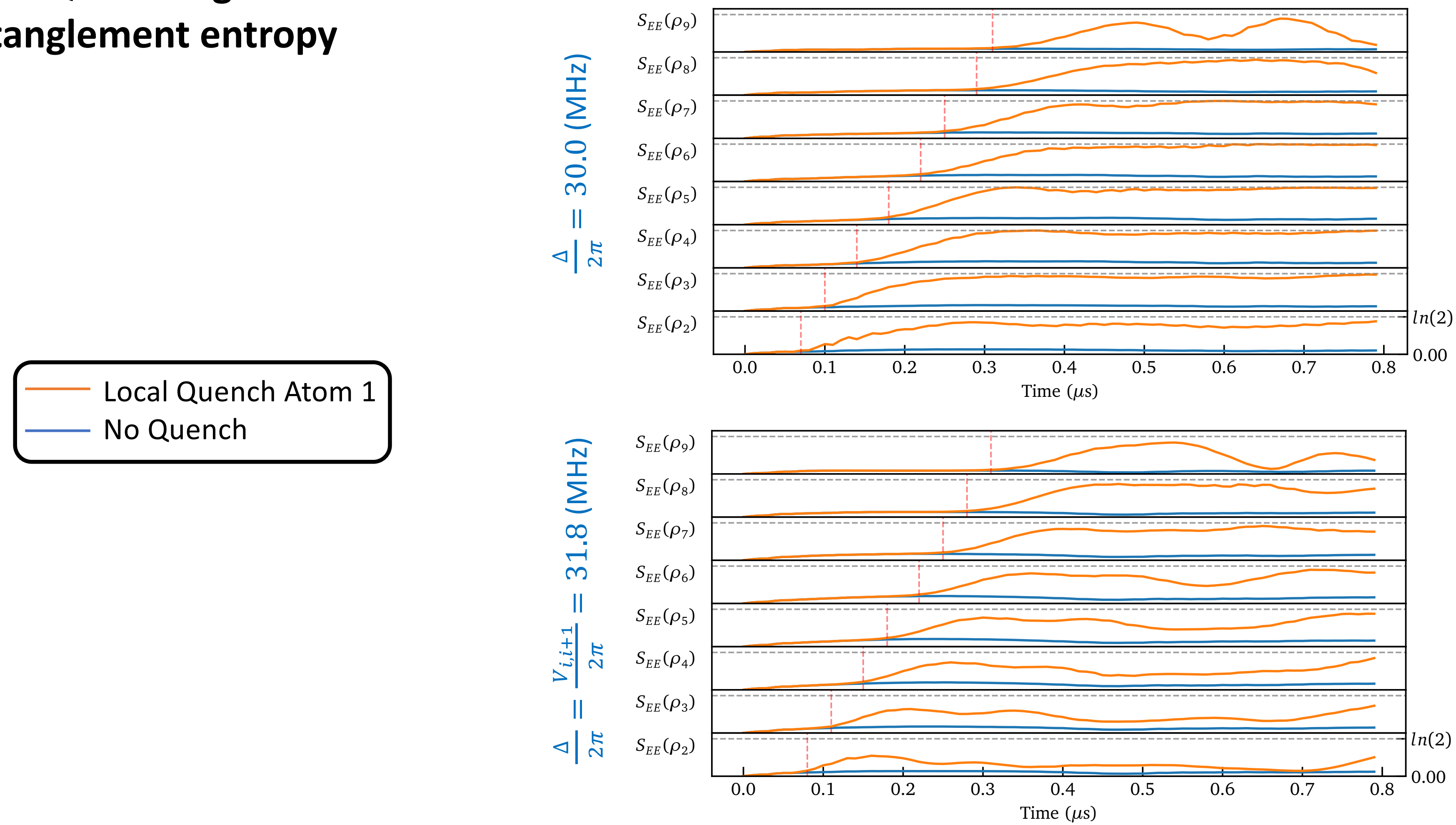
- Reduced density matrix $\rho_i = Tr_B(\rho)$
- VNE $= S_{EE}(\rho_i) = -Tr[\rho_i ln(\rho_i)]$
- Bipartite entanglement between each qubit and rest of the system
- $t_{quench} = 0.05\ \mu s$

Local Quench Atom 1
No Quench





Local Quenching:
Entanglement entropy



Local Quenching: Concurrence

Entanglement monotone for quantifying entanglement for both pure and mixed state of two qubits

$C(\rho) = \max(0, \lambda_1 - \lambda_2 - \lambda_3 - \lambda_4)$ $\quad\quad$ $\rho = \rho_{i,\,j}$ 4x4 reduced density matrix of pairs of qubits

With λ_i eigenvalues of matrix: R = $\sqrt{\sqrt{\rho}\,\rho^*\sqrt{\rho}}$

$C(\rho)$ = 1 Maximumly entangled Bell state

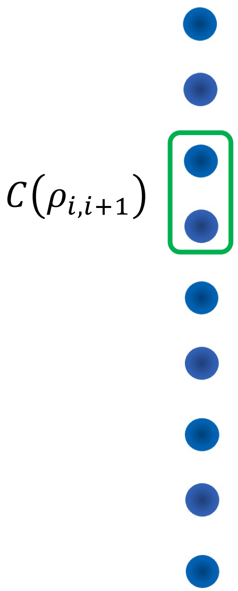
$C(\rho)$ = 0 Separable state

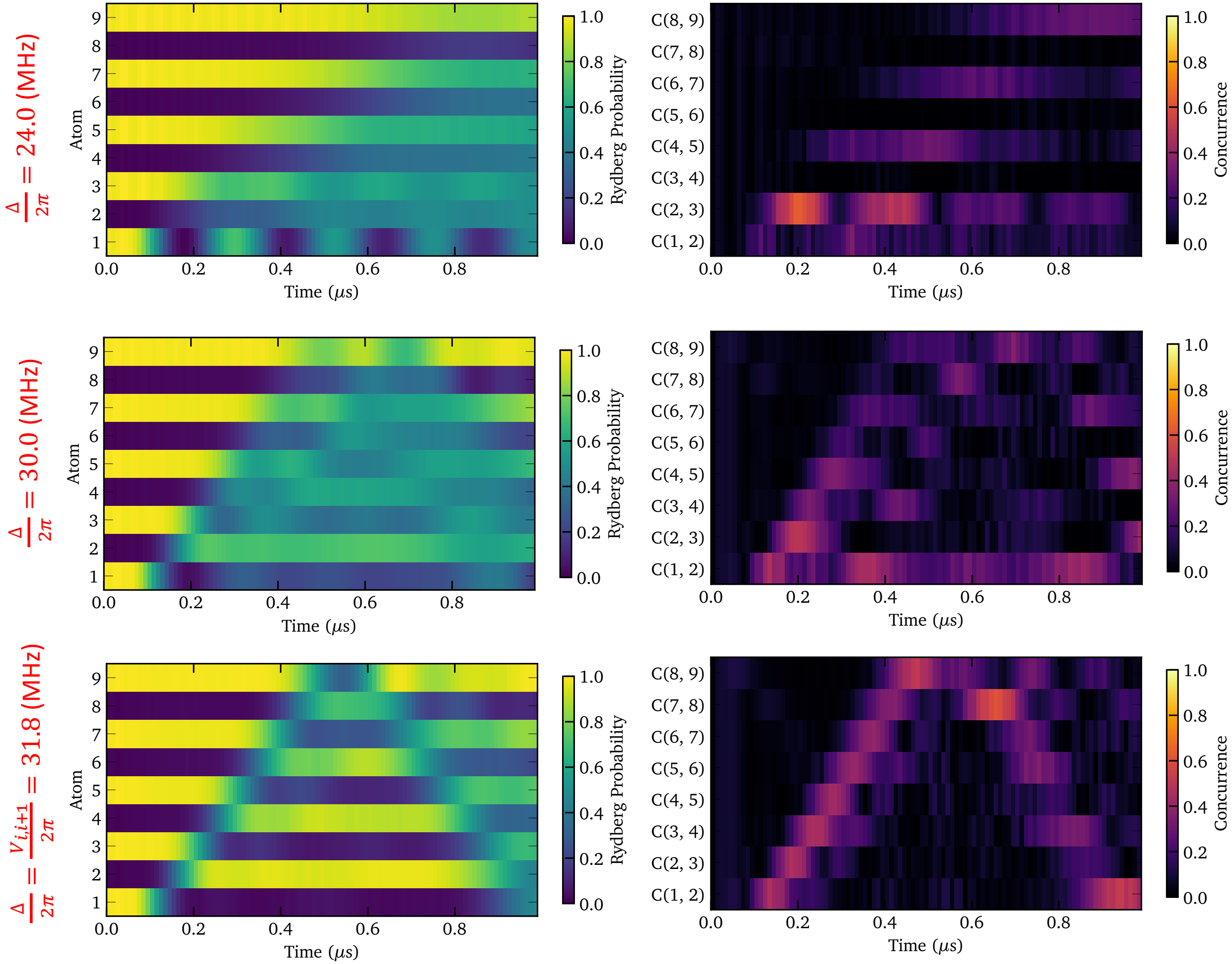
Key Idea: Pairwise entanglement between two qubits

Hill, S., & Wootters, W. K. (1997). Entanglement of a Pair of Quantum Bits. *arXiv:quant-ph/9703041*

Local Quenching: Concurrence

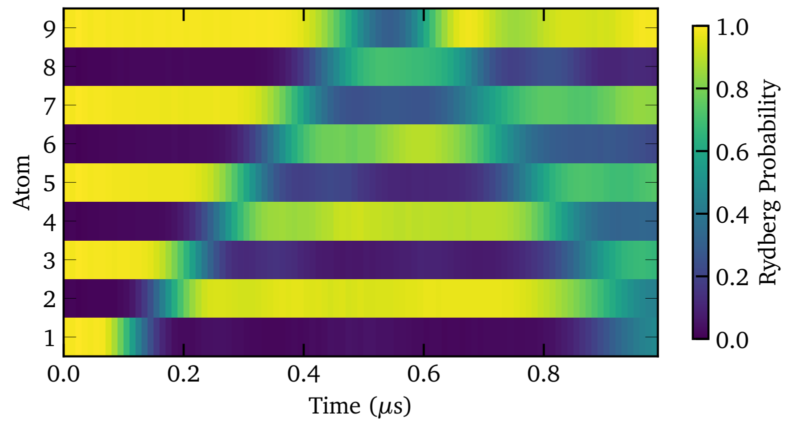
Entanglement monotone for quantifying entanglement for a mixed state of two qubits



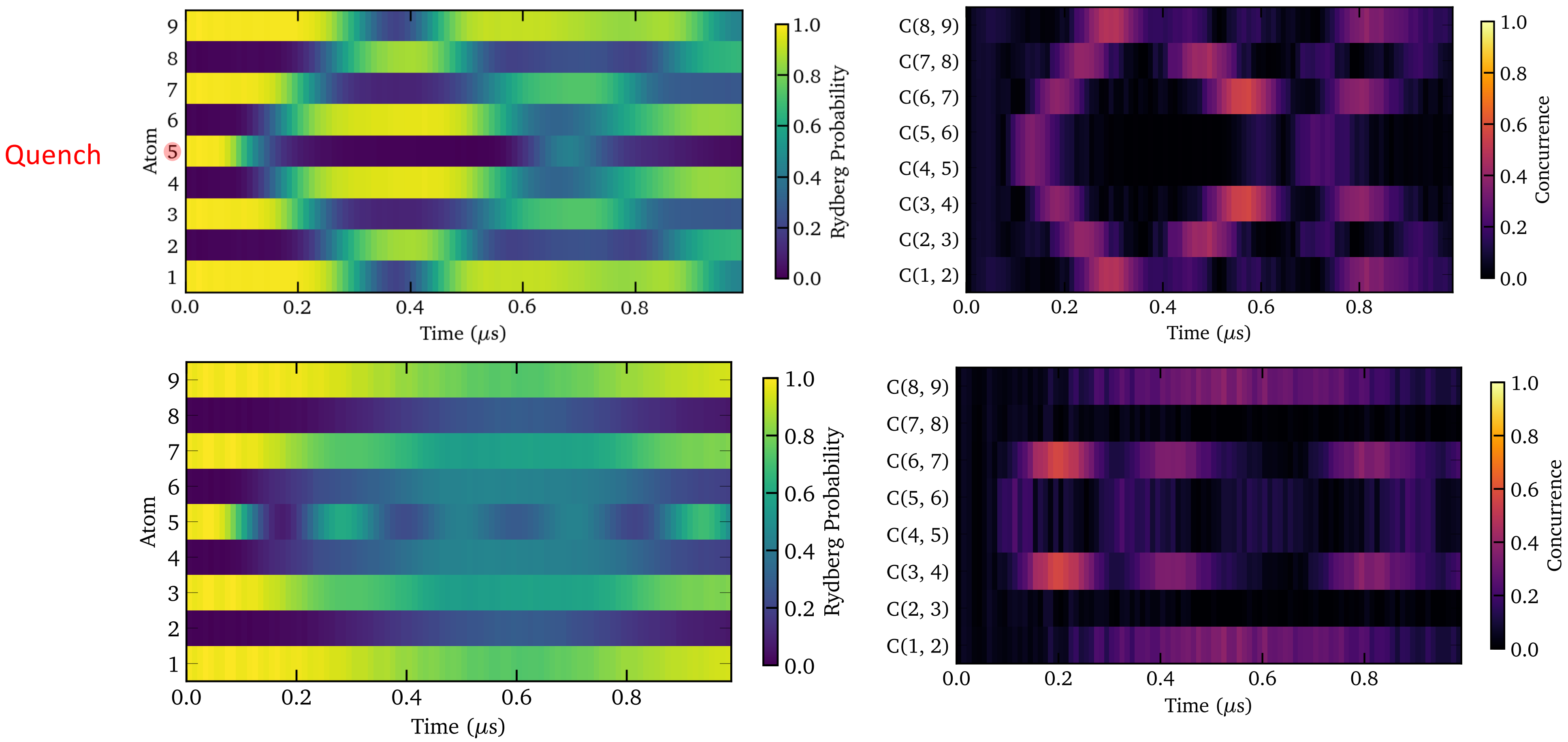


Acknowledgements

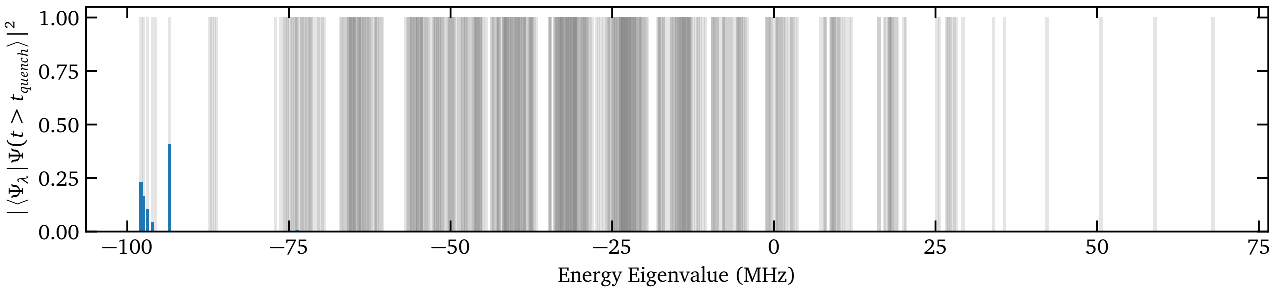
- Supervisor: Prof Stuart Adams
- PHD Student: Toonyawat Angkhanawin

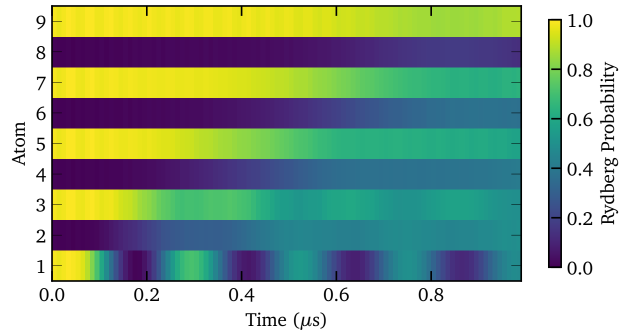


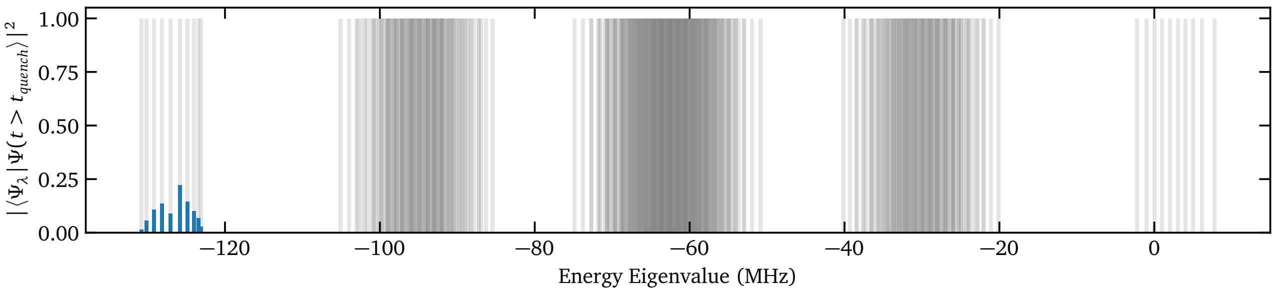
Other Local Quenches

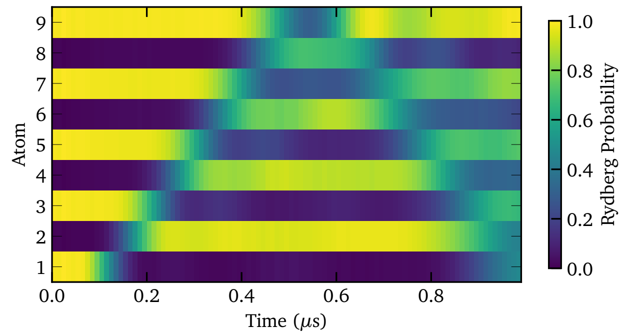


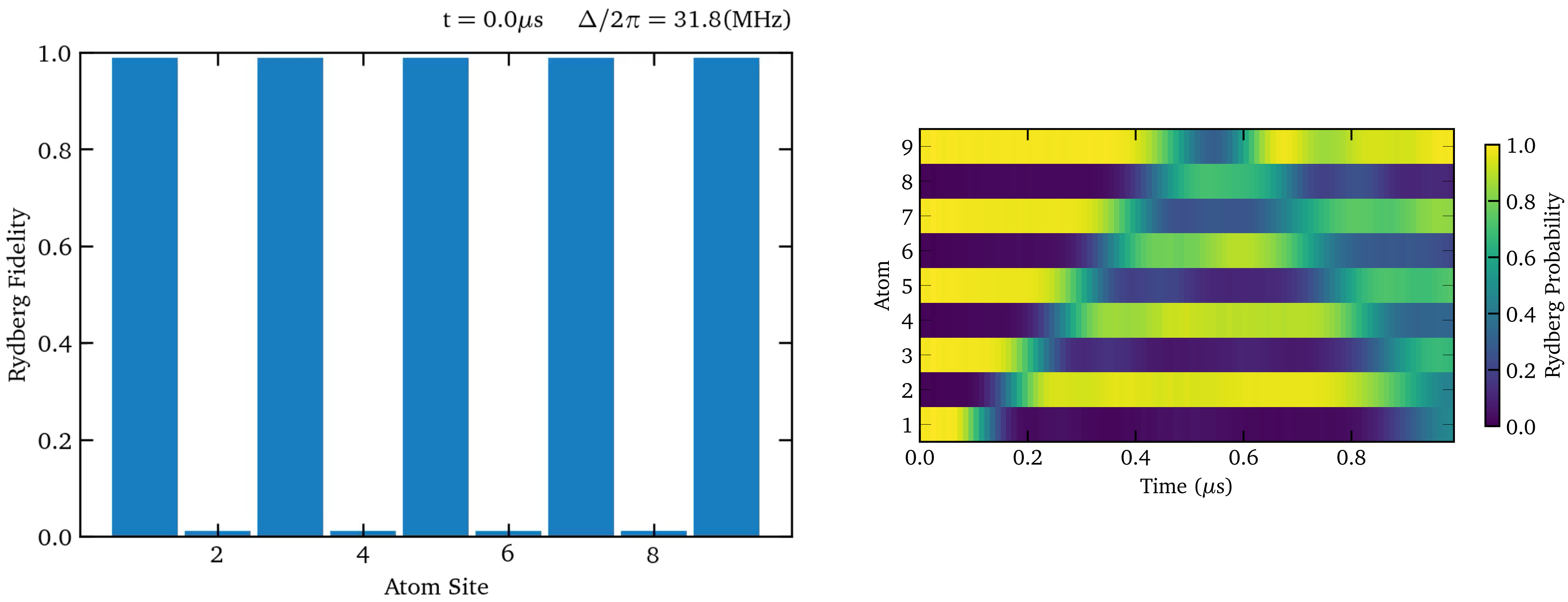
Eigenenergy spectrum











t = 0.0μs Δ/2π = 31.8(MHz)
Rydberg Fidelity
Atom Site
Atom
Time (μs)
Rydberg Probability