Acknowledgments

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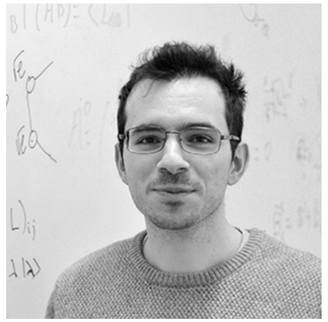

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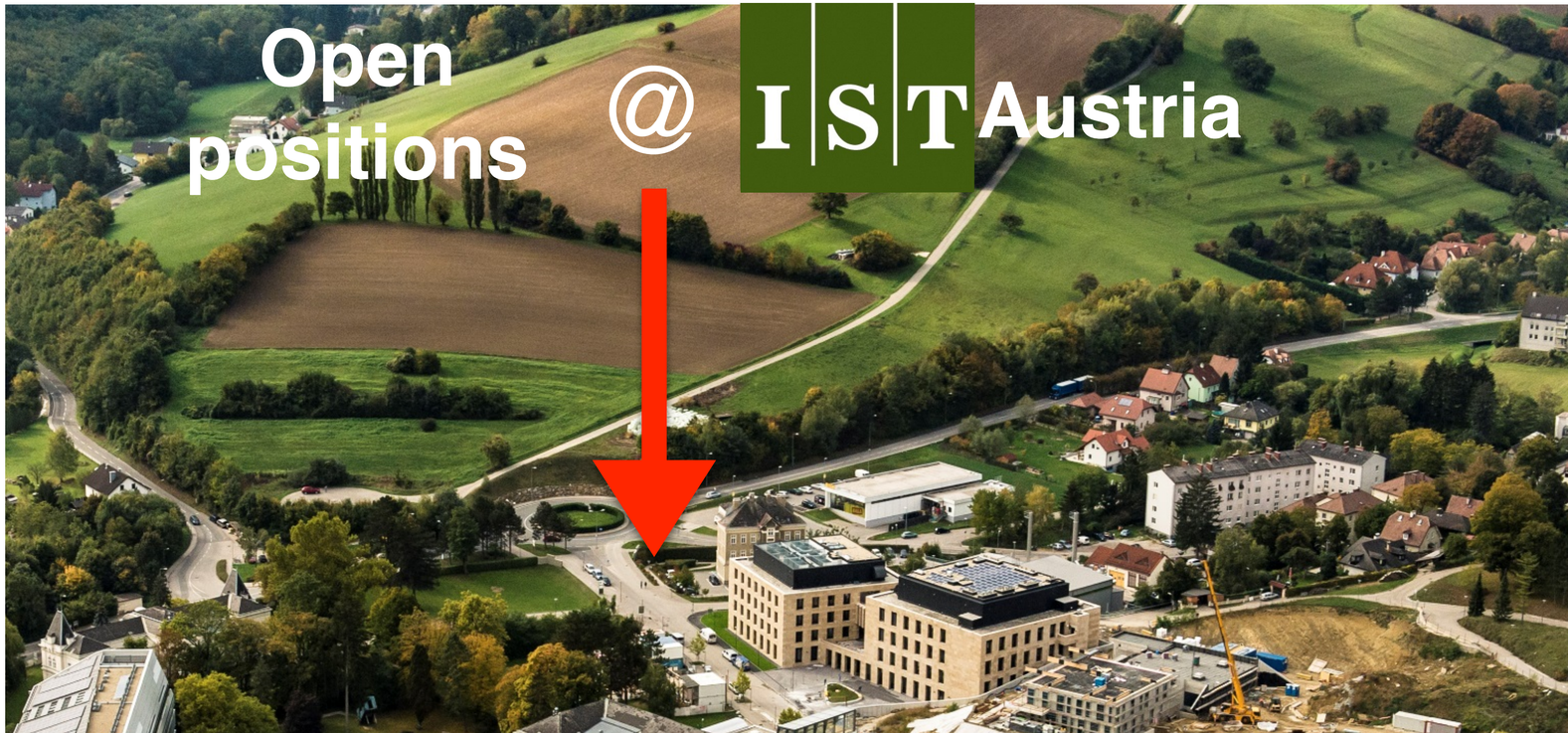

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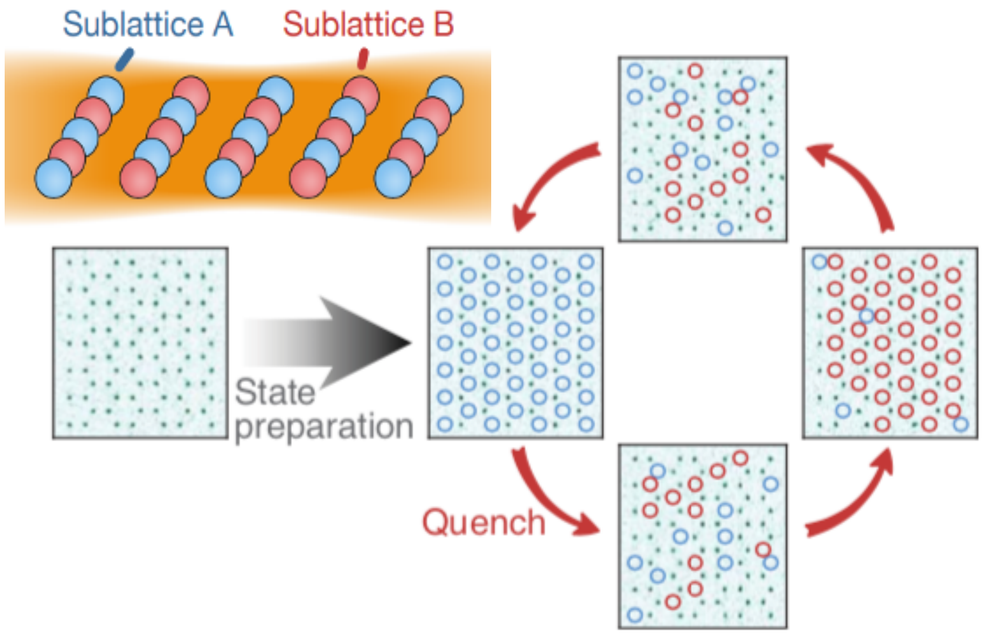
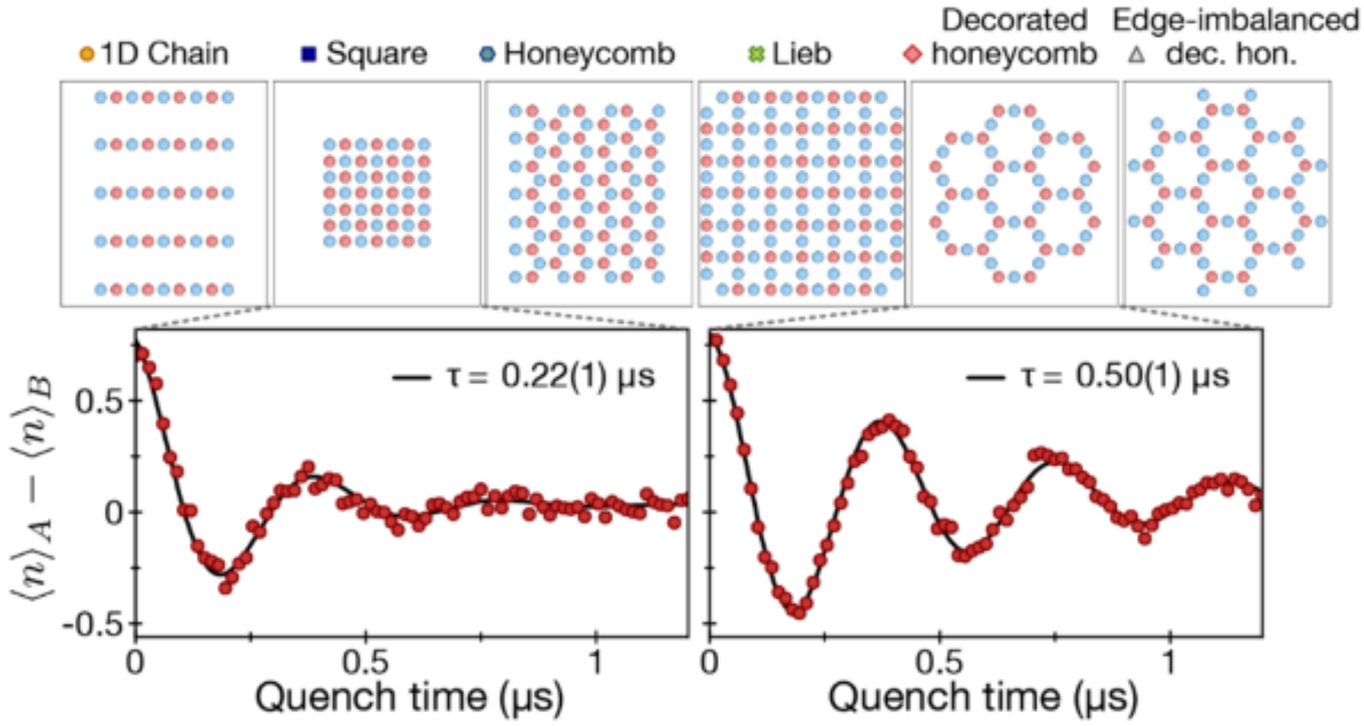
Phenomenology of scars: experimental data



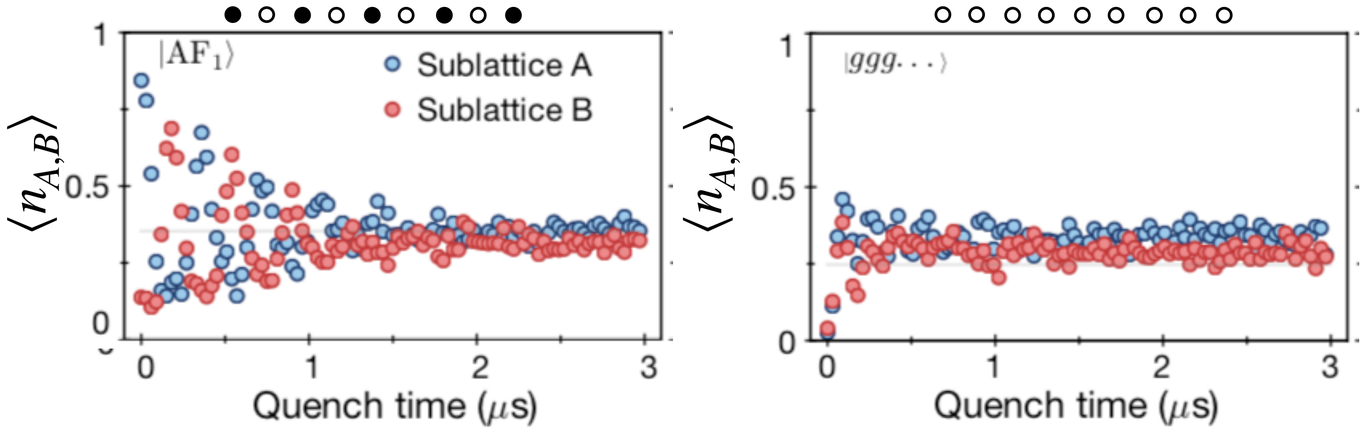
[Bluvstein et al, Science 2021]



Puzzles:

(i) oscillations from highly excited state $T = \infty$

(ii) atypicality between different initial states



Fidelity revivals in projected Hilbert space

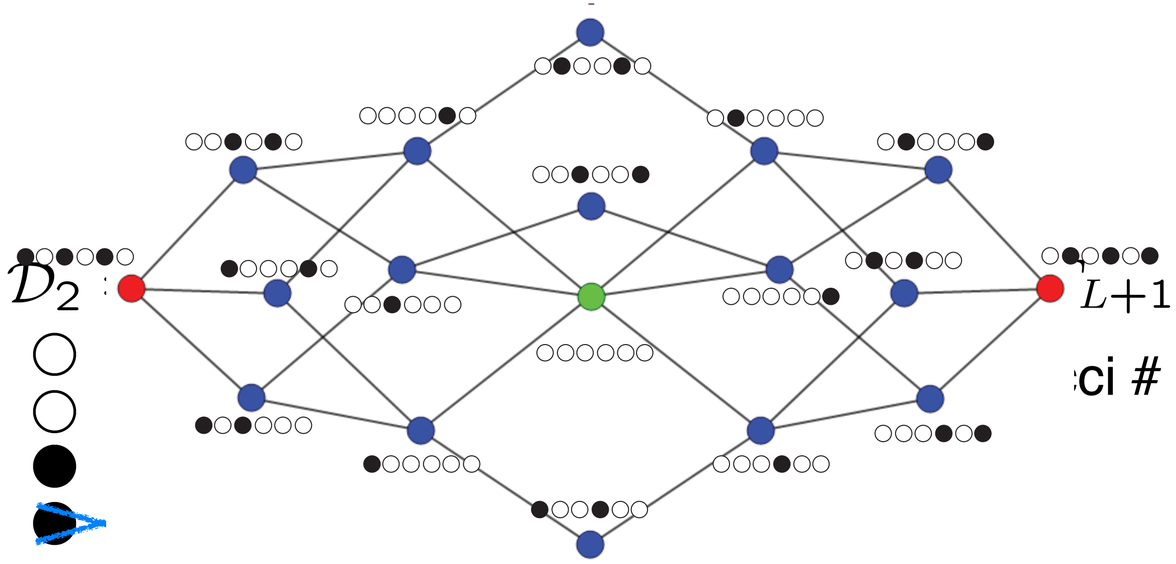
$$V_{nnn} \ll \Omega \ll V_{nn}$$

$$\mathcal{H} = \frac{1}{2}\Omega(t)\sum_i \sigma_x^{(i)} - \Delta(t)\sum_i n_i + \sum_{i<j} V_{ij} n_i n_j$$

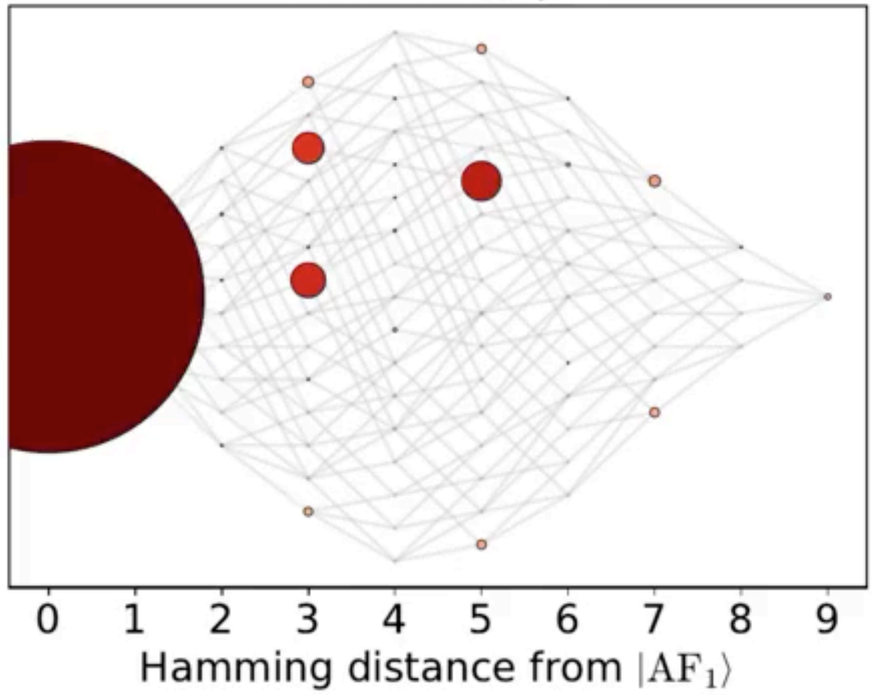
PXP Hamiltonian

$$H = \frac{1}{2}\Omega \sum_i P_{i-1}\sigma_i^x P_{i+1} - \Delta \sum_i n_i + O(\Omega^2/V_{nn}) + O(V_{nnn})$$

[Fendley, Sengupta, Sachdev, PRB'04]
[Fendley, Schoutens, PRL'05]

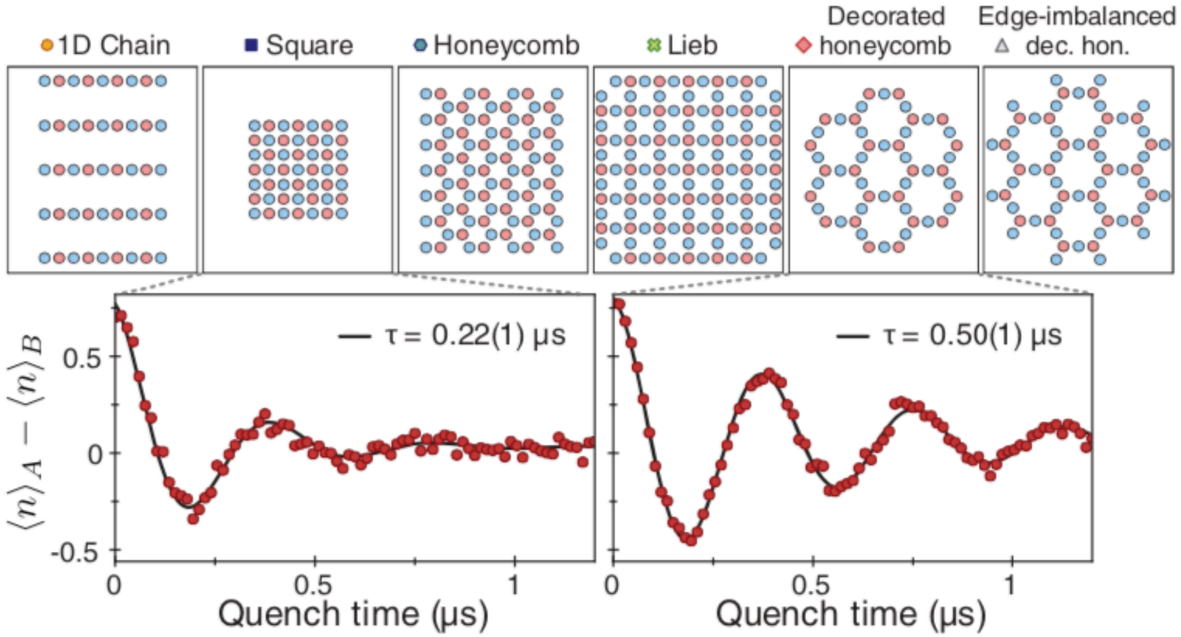


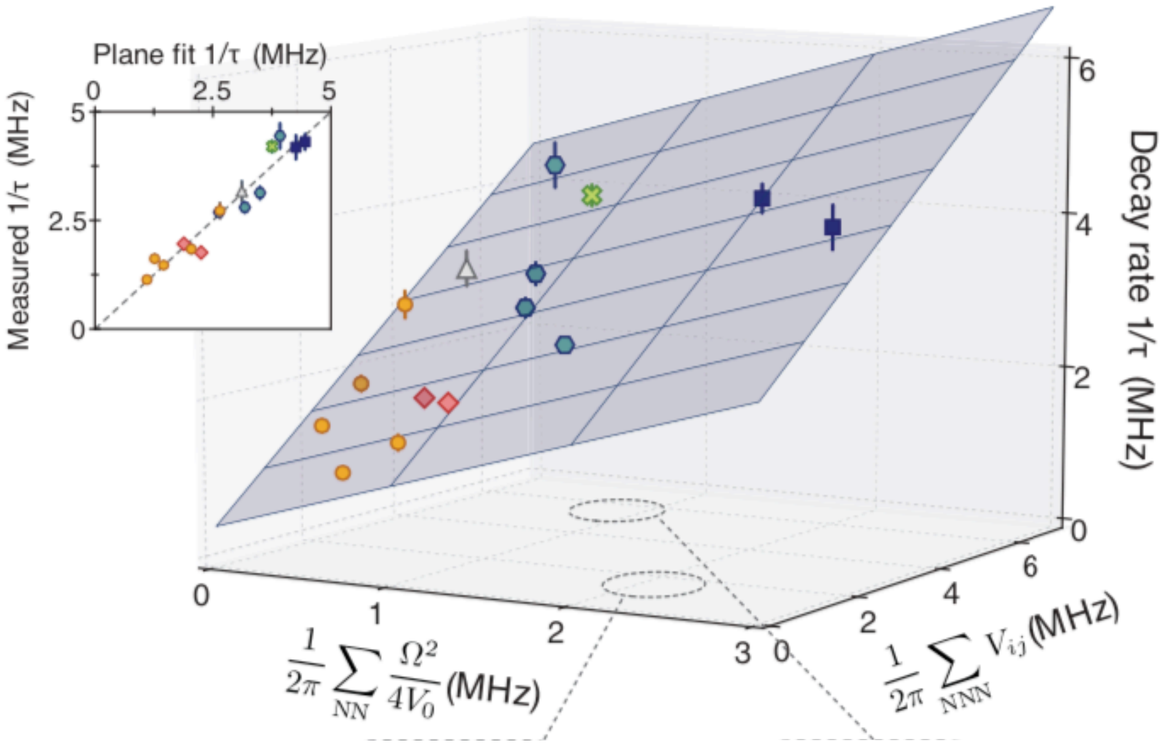
$L = 9,\ \mathscr{D} = 89,$ experiment



Puzzle: full many-body state revivals!

Experiments: limit on scar lifetime





$$\mathcal{H} = \frac{1}{2}\Omega(t)\sum_i \sigma_x^{(i)} - \Delta(t)\sum_i n_i + \sum_{i<j} V_{ij} n_i n_j$$

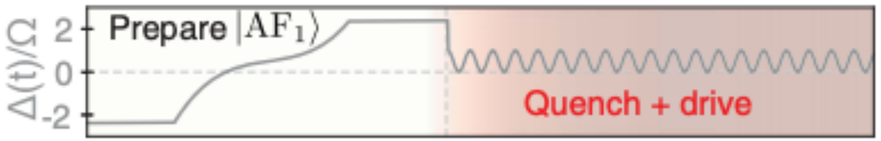
$$\frac{1}{\tau} = \alpha\left(\frac{1}{2\pi}\sum_{\mathrm{NN}}\frac{\Omega^2}{4V_0}\right) + \beta\left(\frac{1}{2\pi}\sum_{\mathrm{NNN}} V_{ij}\right) + \frac{1}{\tau_0}$$

Limit on scars lifetime?

Periodic driving improves scar lifetime

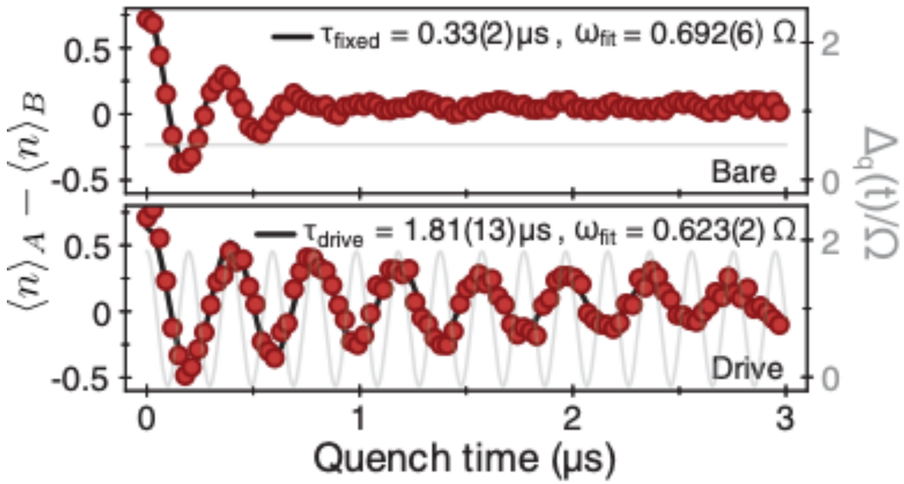
[Dolev et al, Science 2021]

9 atom 1d chain

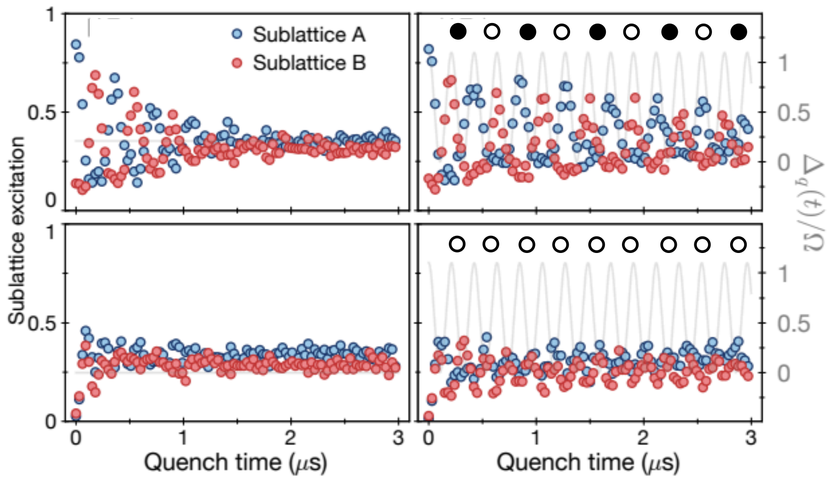


$$\Delta(t) = \Delta_0 + \Delta_m \cos(\omega_m t)$$

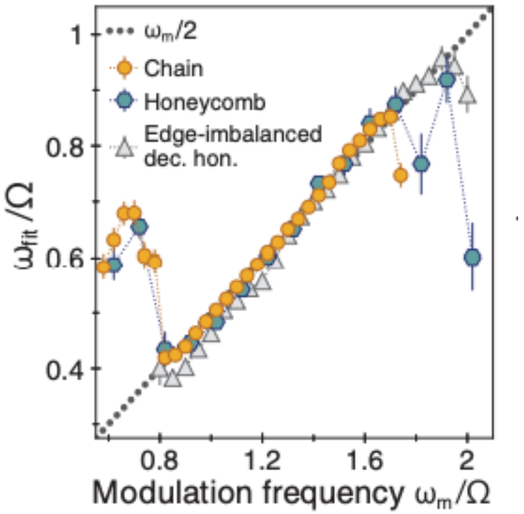
$$\tau_{\text{drive}} \approx 5.5\tau_{\text{fixed}}$$



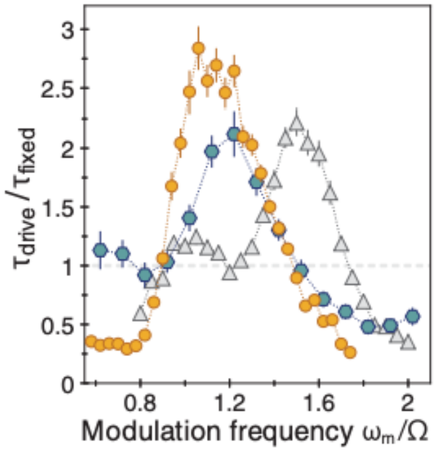
Sensitivity to initial state

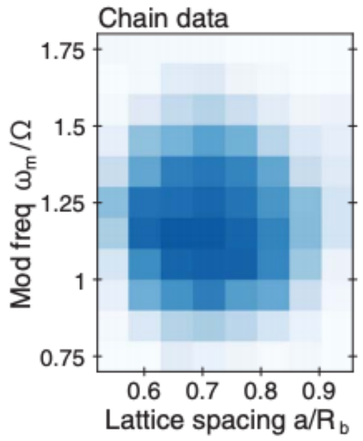


Subharmonic locking



Robustness





how to understand this phenomenology?