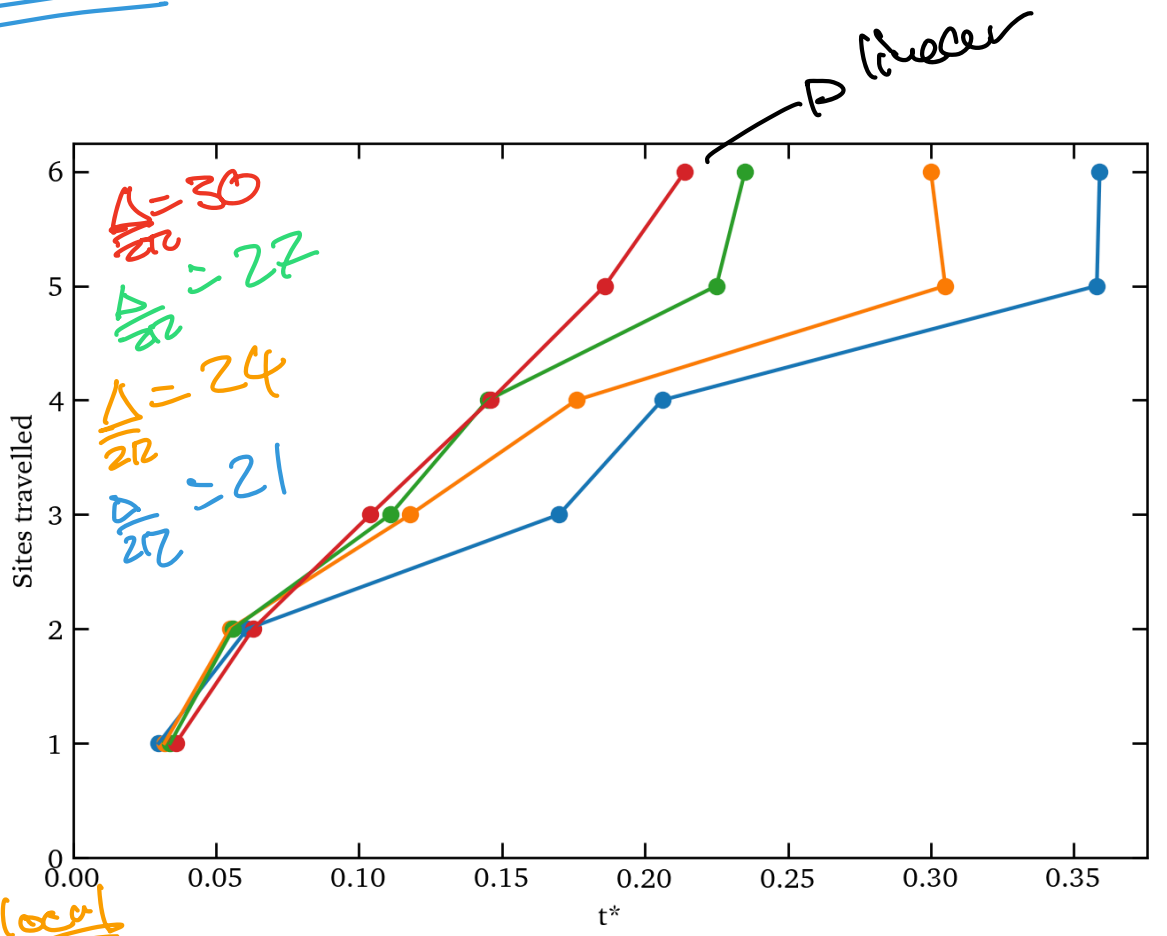
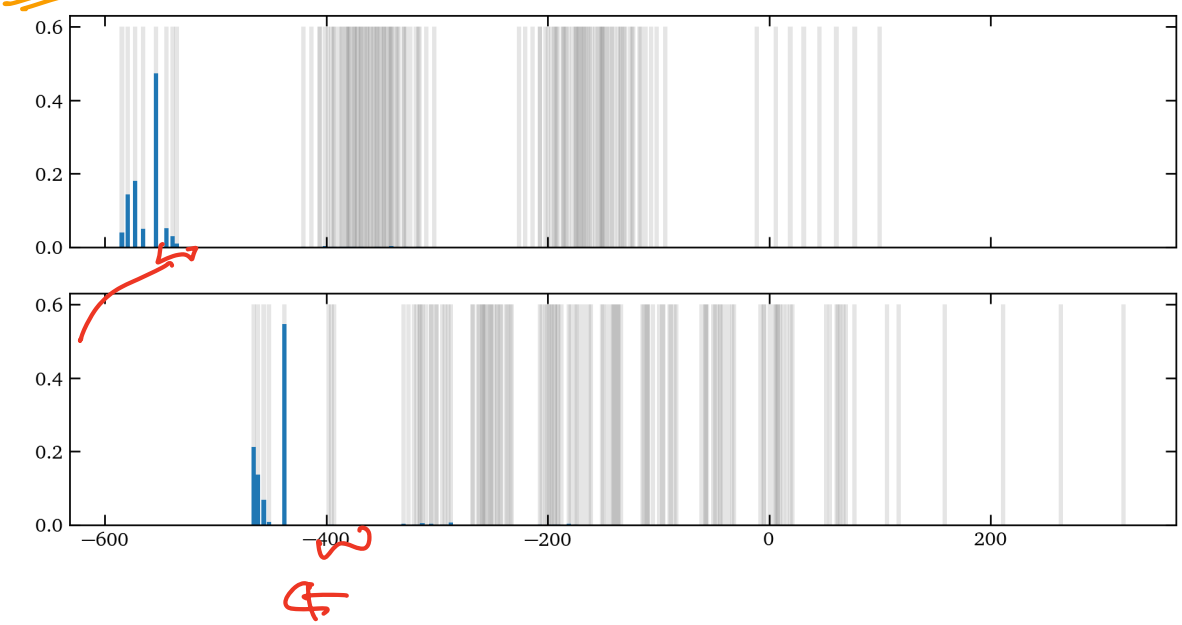
Week 18

- General direction for report
- Local quench: further projective results
- Global quench: area laws

Week 18


Sites travelled
t*
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0
1
2
3
4
5
6


0.0
0.2
0.4
0.6
−600
−400
−200
0
200

Investigate pairwise behavior

Correlation function

Doesn't measure just entanglement
→ classically

Is Note still useful - How effected is one part of the system from the other

Concurrence

Entanglement monotone defined for a mixed state of two qubits

$$C(\rho) \equiv \max(0, \lambda_1 - \lambda_2 - \lambda_3 - \lambda_4)$$

where $\lambda_1, \lambda_2, \lambda_3, \lambda_4$ are the eigenvalues in decreasing order of matrix

$$R = \sqrt{\sqrt{\rho}\,\tilde{\rho}\,\sqrt{\rho}}$$

with $\tilde{\rho} = (\sigma_y \otimes \sigma_y)\,\rho^*\,(\sigma_y \otimes \sigma_y)$

00

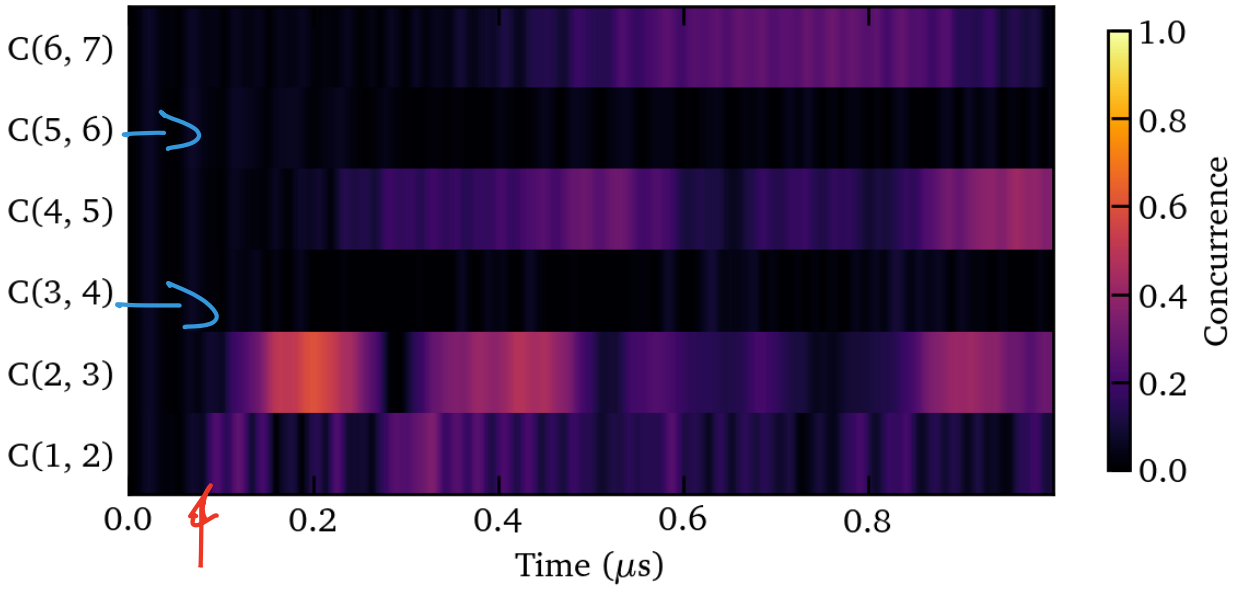
1 ← Bell State

0

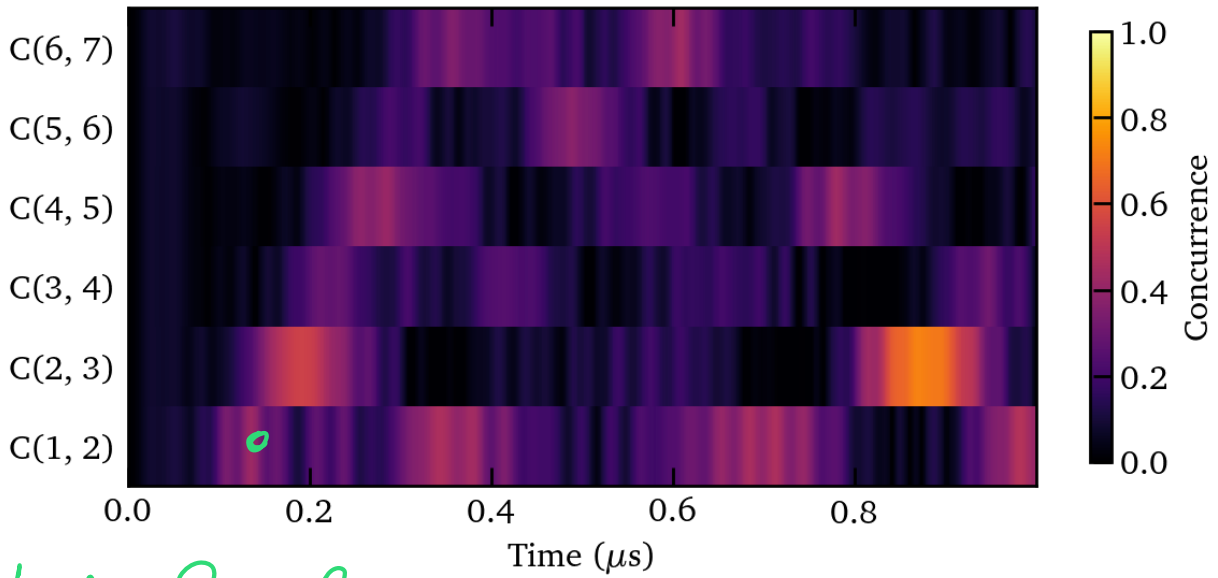
will measure entanglement between pairs of qubits

What do we see

$\frac{\Delta}{2\Omega} = 24$

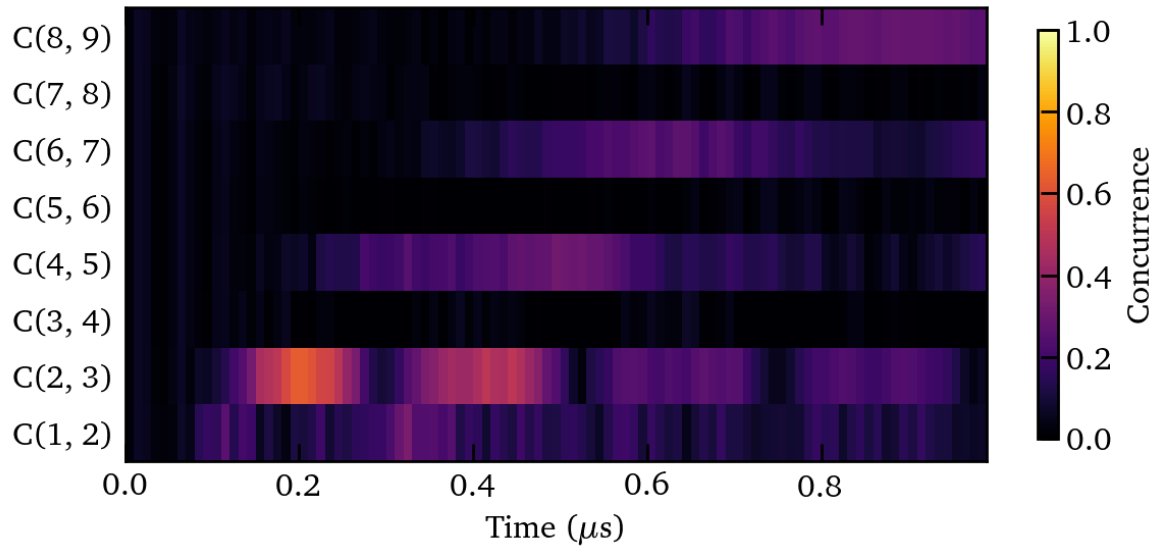


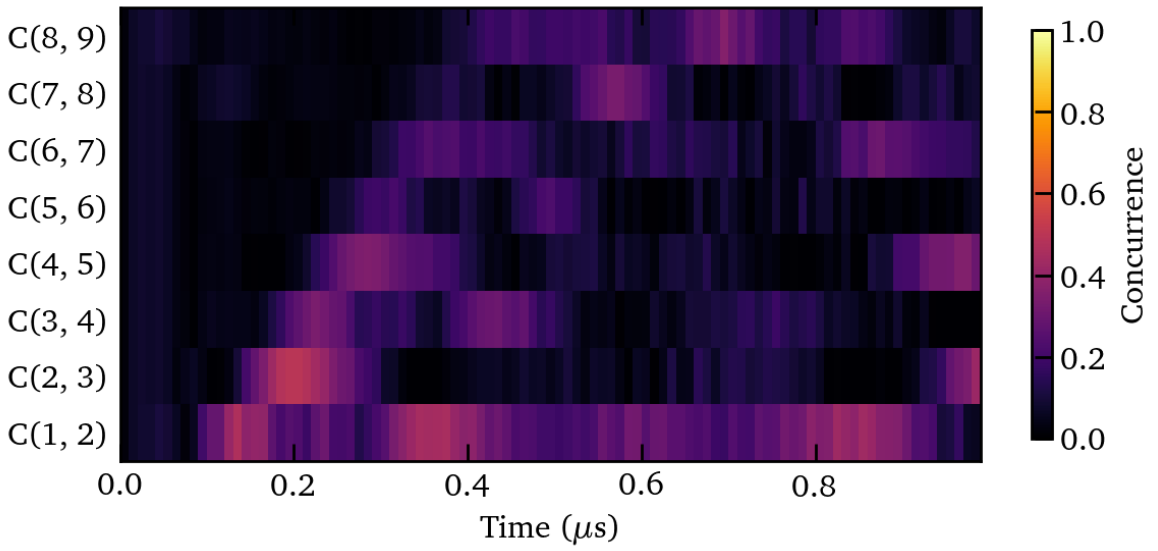
$\frac{\Delta}{2\Omega} = 30$



Why is this significant?

- Big question on what effect propagation of entanglement in a system
- Propagation of entanglement slowed by pairs
- Reducing the system down
  → closer model


C(8, 9)
C(7, 8)
C(6, 7)
C(5, 6)
C(4, 5)
C(3, 4)
C(2, 3)
C(1, 2)
0.0
0.2
0.4
0.6
0.8
Time (μs)
1.0
0.8
0.6
0.4
0.2
0.0
Concurrence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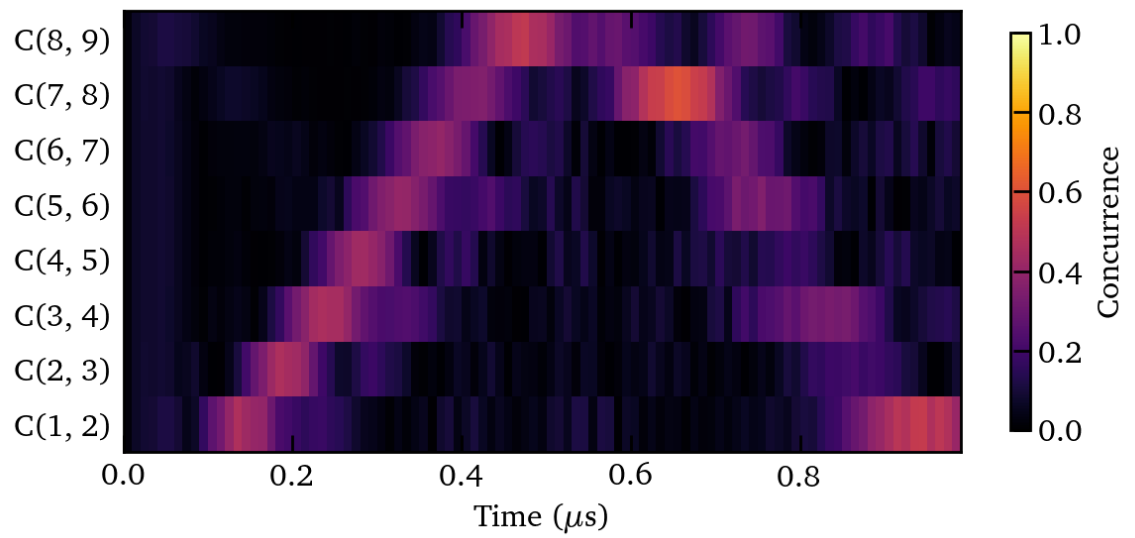
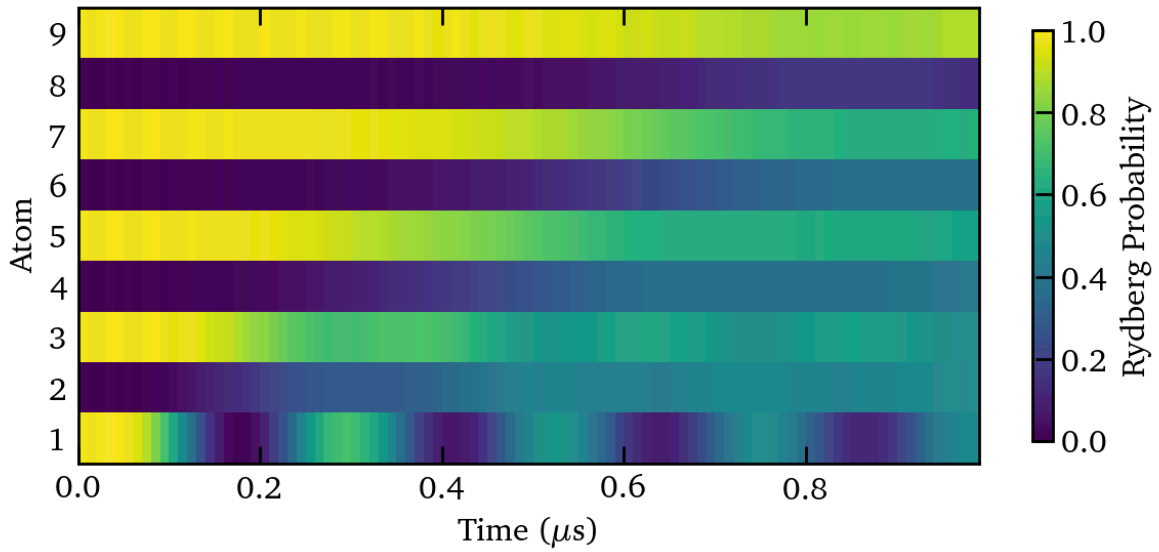
C(4, 5)
C(3, 4)
C(2, 3)
C(1, 2)
0.0
0.2
0.4
0.6
0.8
Time (μs)
1.0
0.8
0.6
0.4
0.2
0.0
Concurrence

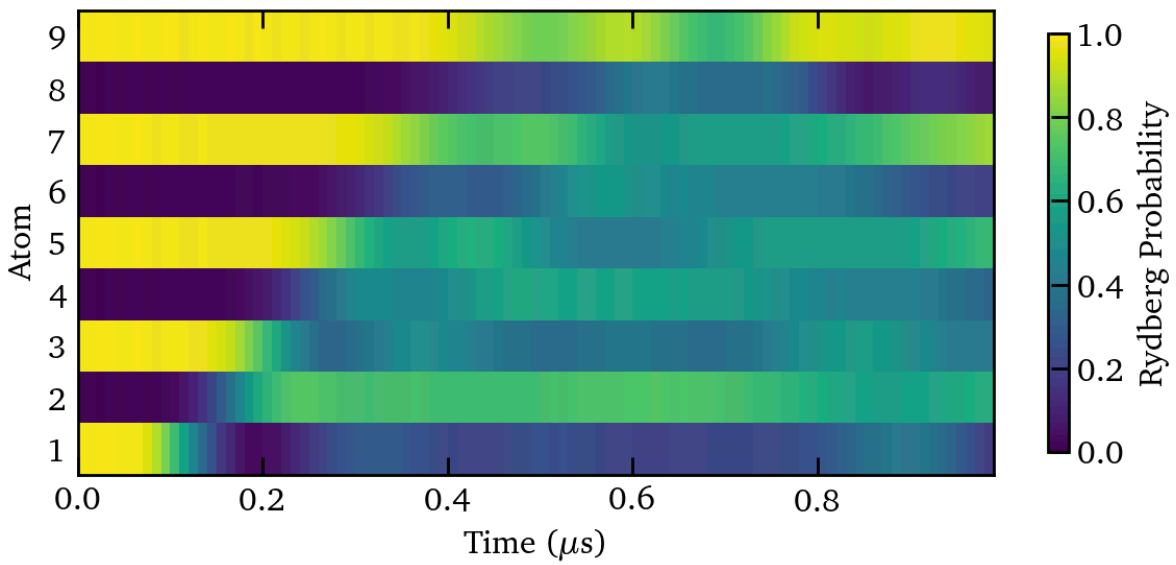

C(8, 9)
C(7, 8)
C(6, 7)
C(5, 6)
C(4, 5)
C(3, 4)
C(2, 3)
C(1, 2)
0.0
0.2
0.4
0.6
0.8
Time (μs)
1.0
0.8
0.6
0.4
0.2
0.0
Concurrence

$V_{12} = 31.85$

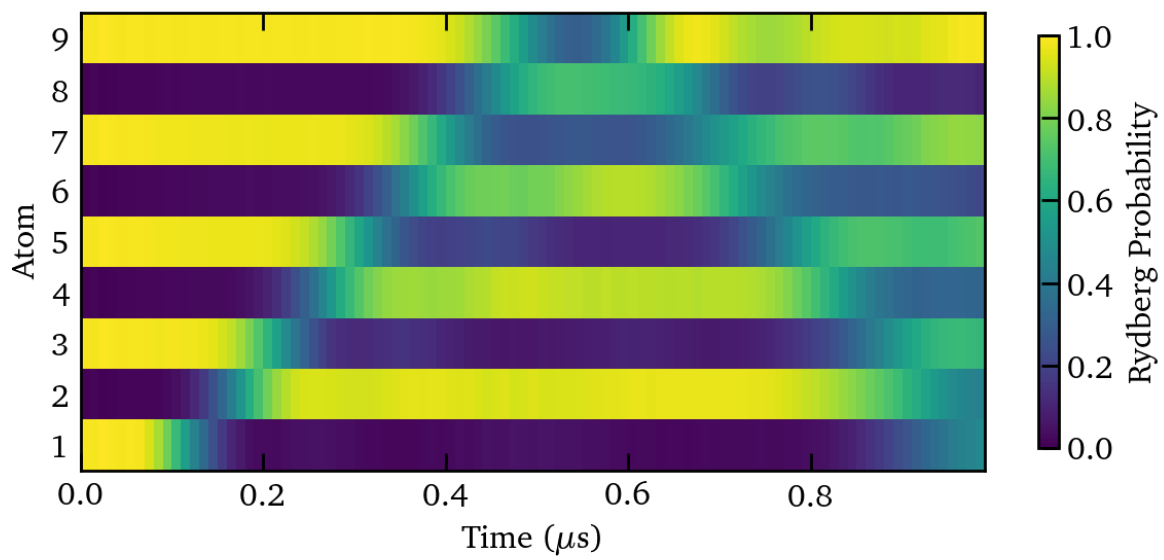
$\frac{\Delta}{2\Omega} = 24$



$\frac{\Delta}{2\Omega} = 3$



$\frac{\Delta}{2\Omega} = 31.9$



Do all these speeds follow light cone over all?

L-B Bound

Area vs volume laws