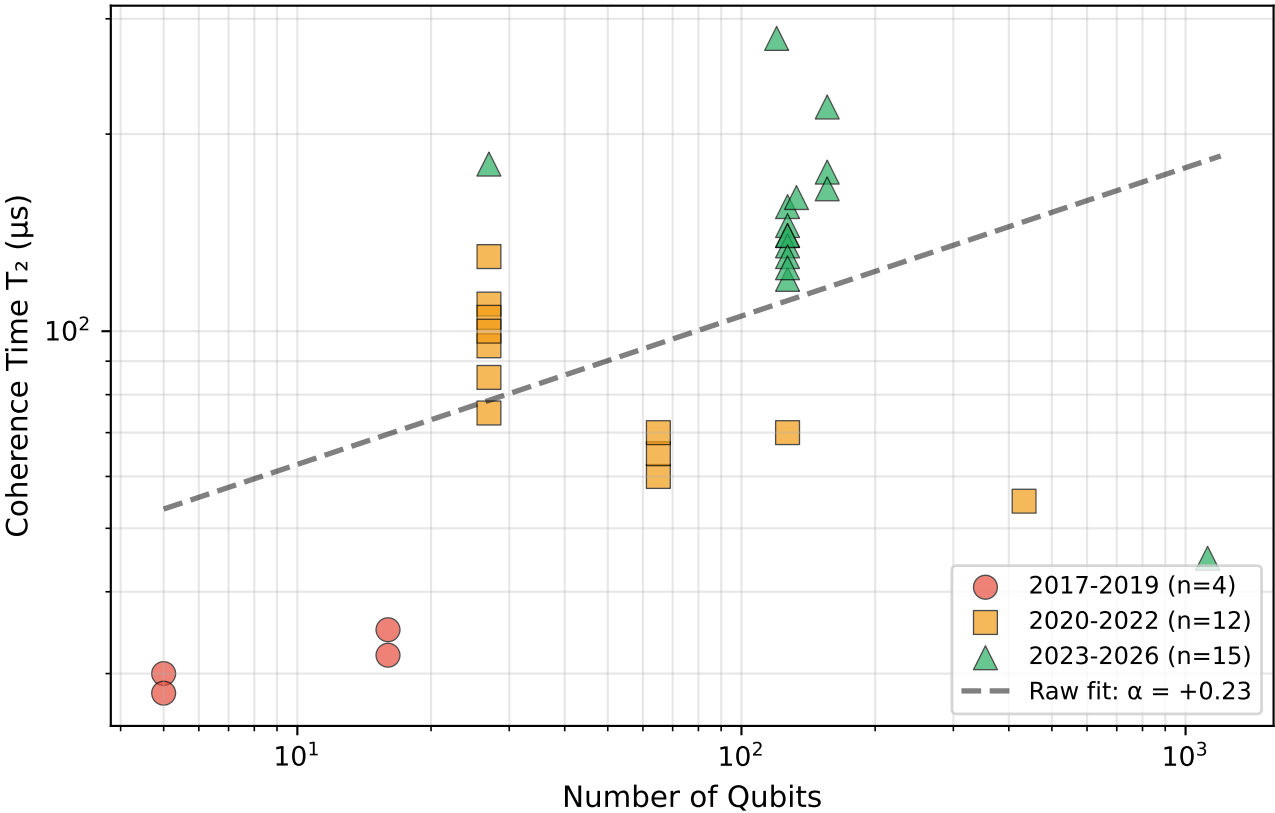
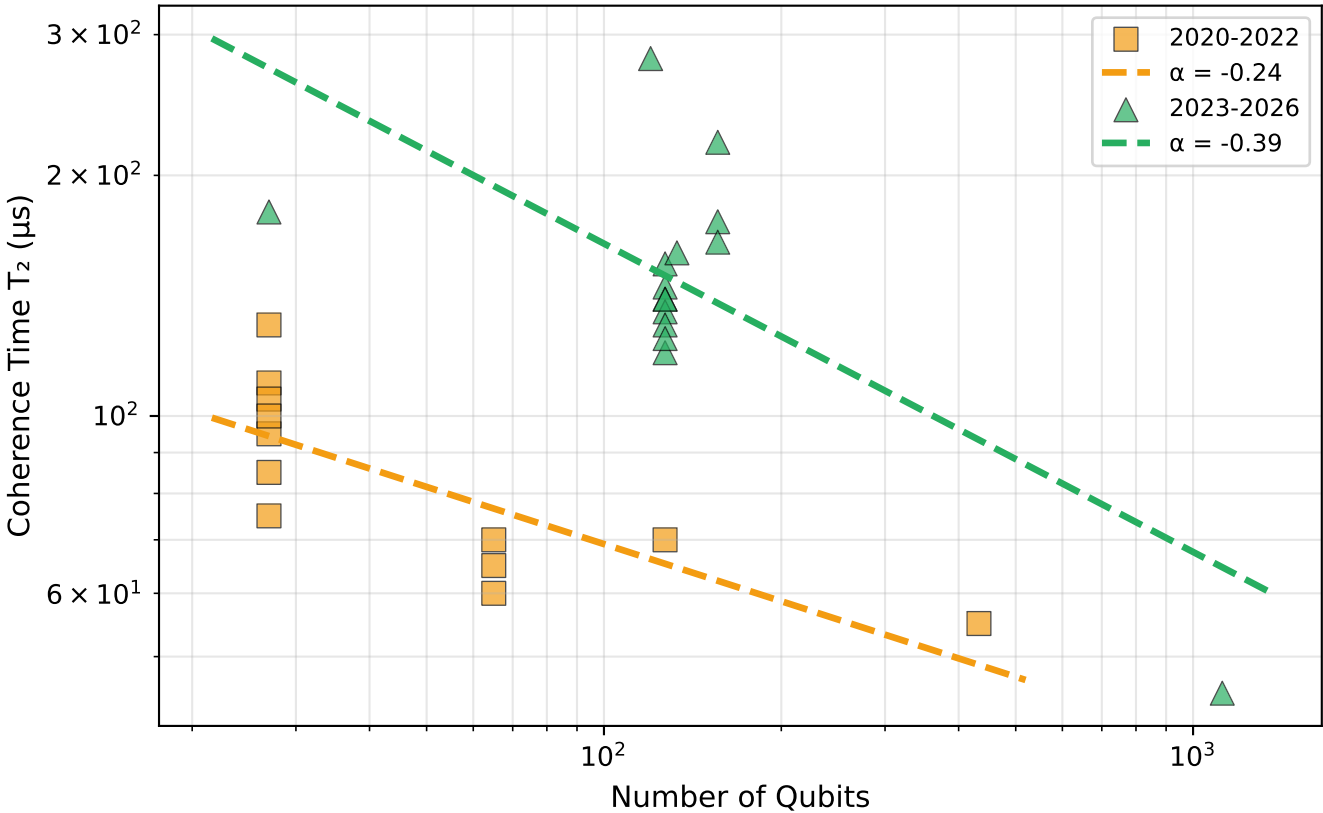


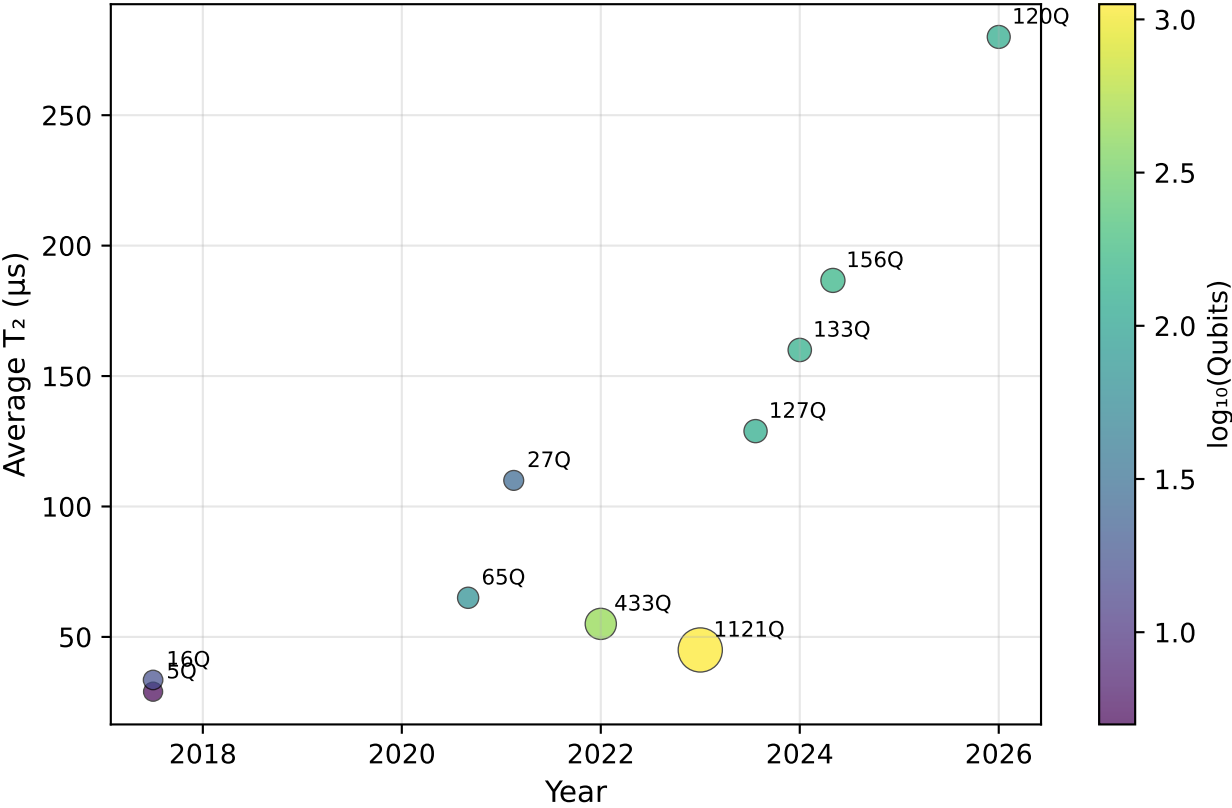
RAW DATA: Technology Confounds Scaling  
Newer (larger) processors have better T<sub>2</sub>



SAME-GENERATION: True Negative Scaling  
 $\alpha \approx -0.3$  to  $-0.4$  (larger = worse)



Technology Progression: Better T<sub>2</sub> Over Time  
(Size = qubit count, Color = log<sub>10</sub>(qubits))



RTM QUANTUM DECOHERENCE ANALYSIS: IBM PROCESSORS

DATASET

- Processors analyzed: 31
- Qubit range: 5 - 1121
- T<sub>2</sub> range: 28 - 280 μs
- Time span: 2017 - 2026

KEY RESULTS

- RAW SCALING (confounded):  
 $\alpha = +0.23 \pm 0.08$   
→ Misleading! Technology improvements dominate
- SAME-GENERATION SCALING (true effect):  
2020-2022:  $\alpha = -0.24$  (n=12)  
2023-2026:  $\alpha = -0.39$  (n=15)  
→ TRUE  $\alpha \approx -0.3$  to  $-0.4$

PHYSICAL INTERPRETATION

- Negative  $\alpha$ : Larger systems decohere FASTER
  - Decoherence is COLLECTIVE, not independent
  - Sources: crosstalk, correlated noise, TLS defects
- RTM TRANSPORT CLASS: INVERSE/COLLECTIVE ( $\alpha < 0$ )
- Similar to Stokes-Einstein diffusion ( $\alpha = -1$ )
    - System size works AGAINST coherence
  - Each added qubit adds decoherence pathways

COMPARISON TO OTHER  $\alpha < 0$  SYSTEMS

- Stokes-Einstein (bulk diffusion):  $\alpha = -1.19$ 
  - Quantum decoherence:  $\alpha \approx -0.35$
- Both show: BIGGER = SLOWER/WORSE