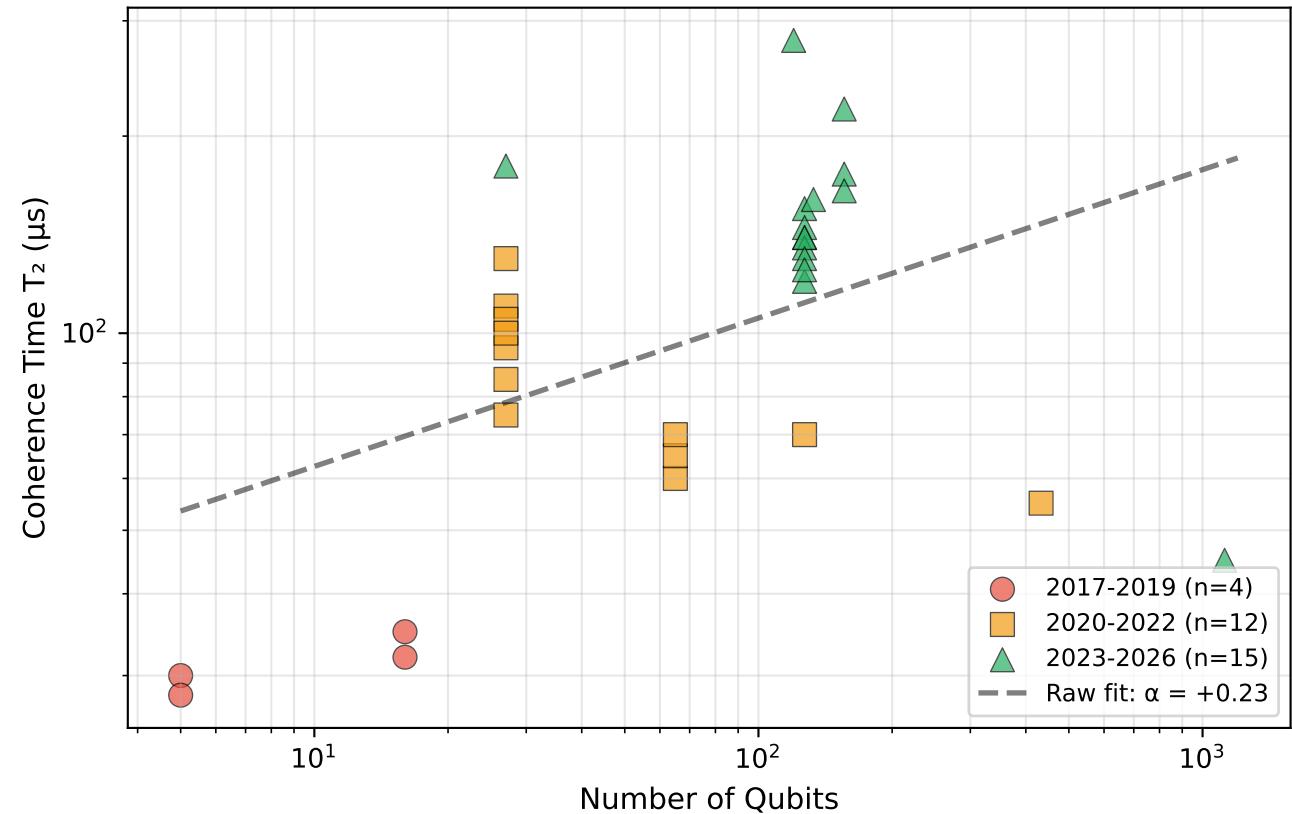
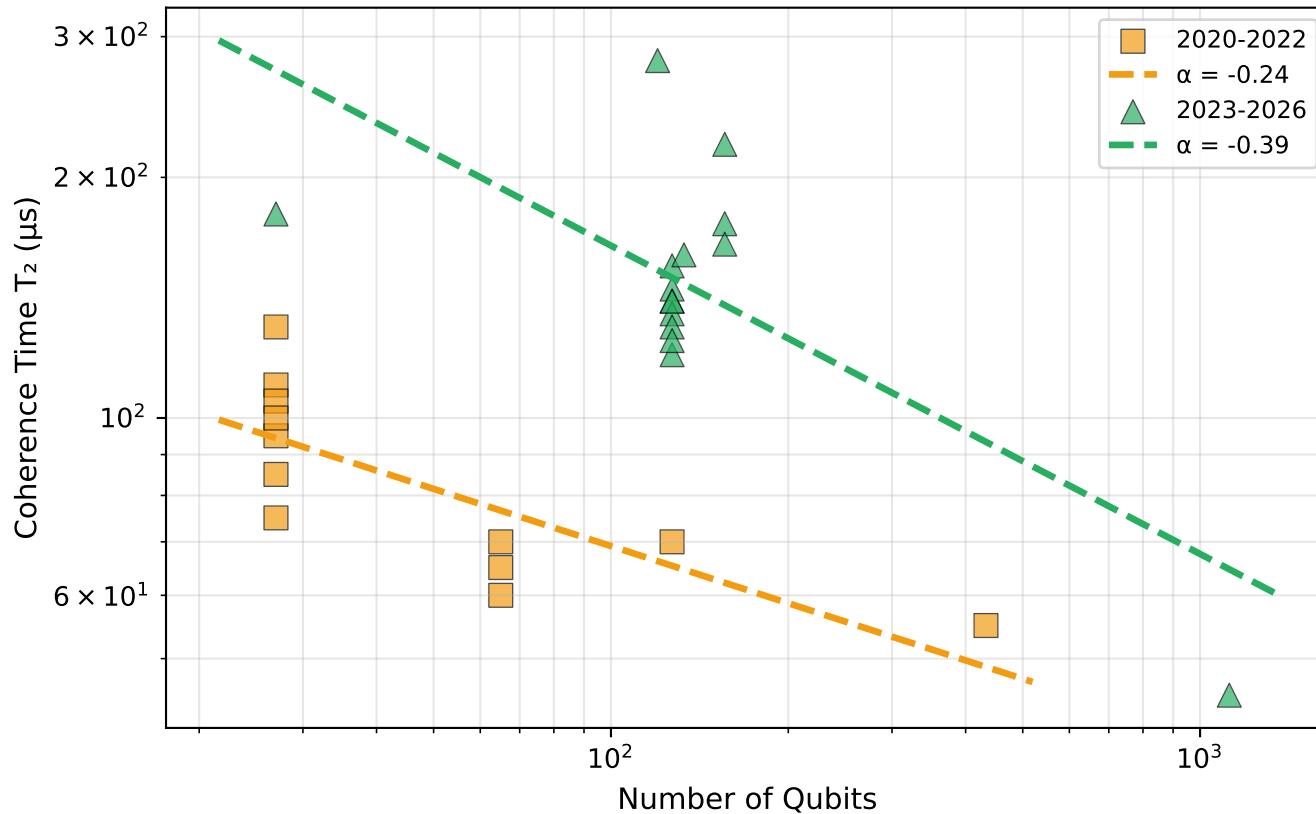


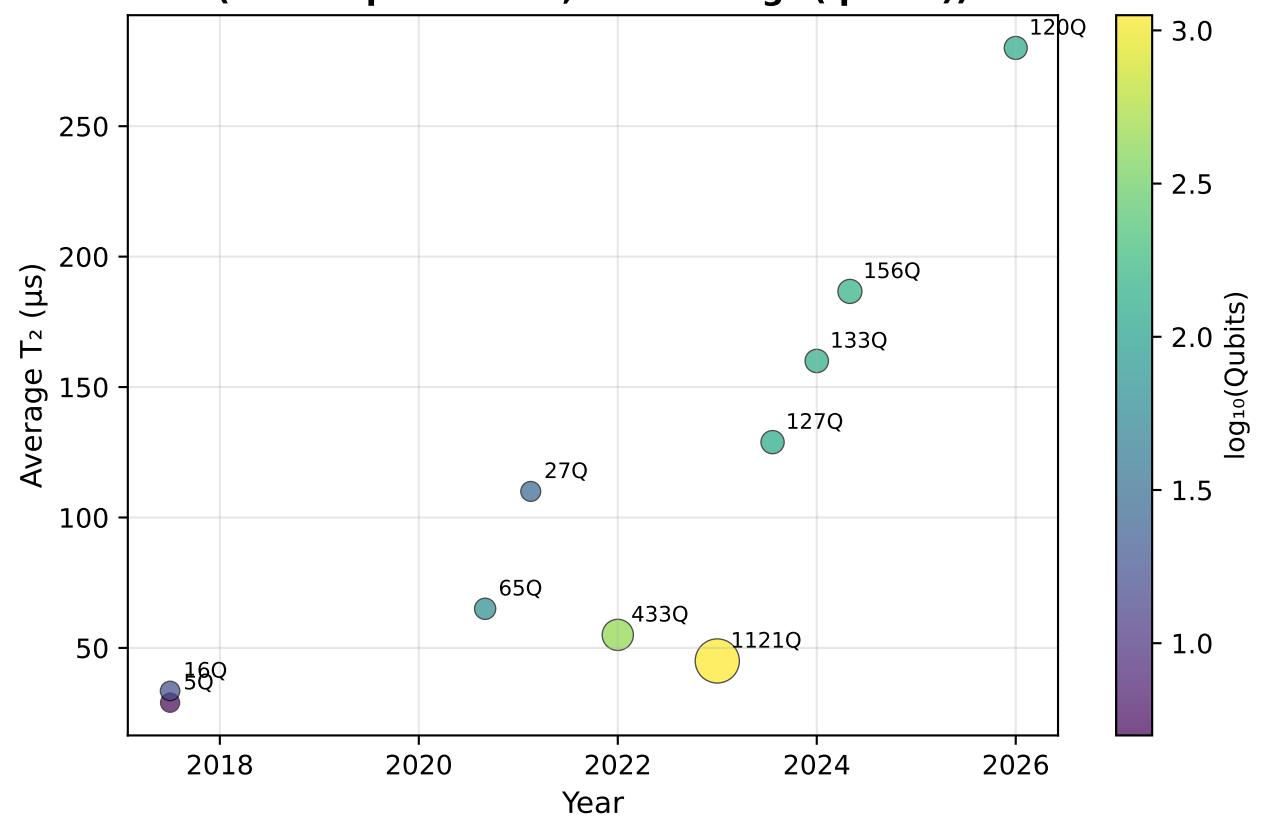
RAW DATA: Technology Confounds Scaling
Newer (larger) processors have better T₂



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



Technology Progression: Better T₂ Over Time
(Size = qubit count, Color = $\log_{10}(\text{qubits})$)



RTM QUANTUM DECOHERENCE ANALYSIS: IBM PROCESSORS

DATASET

- Processors analyzed: 31
- Qubit range: 5 - 1121
- T₂ 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 α : 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