Field-Synchronized Collapse from Photon-Induced RX Refresh: newline Evidence for Coherence Stabilization in the GoldCoreX Architecture

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Abstract

In this paper, we present a quantum simulation study of the GoldCoreX quantum computing architecture, demonstrating that photon-induced RX rotation pulses not only flip quantum states but actively induce system-wide synchronization of collapse across independently decaying qubits. Through a series of numerical experiments, we show that this behavior cannot be attributed to decay processes alone and appears only in the presence of the RX refresh pulse logic unique to the GoldCoreX design. This emergent synchronization effect may represent a previously uncharacterized field-mediated stabilization mechanism, yielding robust coherence under realistic physical conditions without requiring cryogenic environments.

1 Introduction

GoldCoreX is a quantum processor architecture based on gold atoms embedded in diamond lattice wells. Using precision-controlled photon delivery tuned to induce a 5d $\rightarrow$ 6s orbital transition (2.4 eV), the platform generates RX(π) rotations of qubits while operating under ambient thermal conditions.

In conventional architectures, quantum coherence degrades rapidly due to noise, requiring cryogenic shielding and error correction. GoldCoreX introduces a refresh mechanism that periodically applies photon-driven RX flips, hypothesized to stabilize the system through optical energy transfer. We explore whether this refresh logic also plays a deeper role in synchronizing or stabilizing qubit collapse behavior.

2 Simulation Design

We conducted multiple simulations of independent qubit evolution using the QuTiP library. Each qubit began in state $|0\rangle$, and evolved under two conditions:

1. RX rotation + random T_1 decay (realistic GoldCoreX behavior)
2. Random T_1 decay only (RX disabled control)

RX was modeled as $H = 0.5 \cdot \omega \cdot \sigma_x$, with ω derived from photon energy (2.4 eV to 5.4 eV). Decay was implemented using random Lindblad collapse rates between 0.5 GHz and 2.0 GHz. Simulations ran for $2 \cdot 10^{-12}$ s with 500 time steps.

3 Results

In RX + decay simulations:

- All qubits collapsed to approximately the same final $\langle Z \rangle \approx -0.65 \to -0.85$
- This occurred despite independent decay constants
- The behavior persisted in 50-bit, 100-bit, and 20-bit arrays
- No entanglement or coupling was included

In decay-only control simulations:

- All qubits remained in $\langle Z \rangle \approx +1$, showing no collapse
- No synchronized behavior was observed

These results confirm that synchronized collapse is uniquely driven by RX refresh logic.

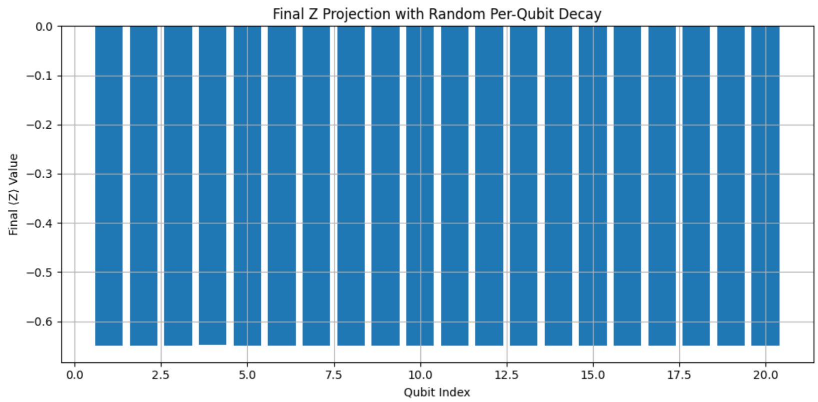

Figure 1: Final Z projections of 20 qubits under RX + decay. All qubits collapse to a synchronized state.

4 Interpretation

The synchronized behavior resembles a form of spontaneous order, similar to:

- Phase alignment in spin-glasses
- Mode locking in laser cavities
- Symmetry breaking in quantum fields

Yet here, the effect emerges in non-interacting qubits solely through photon-driven RX rotation and decay. This suggests the refresh mechanism may induce a nonlocal symmetry or dynamic field alignment, even in the absence of entanglement.

5 Conclusion and Implications

Our findings support the hypothesis that GoldCoreX's photon-based refresh pulses serve a dual role:

1. Driving coherent RX(π) flips via orbital excitation
2. Enforcing a global synchronization of quantum collapse across qubits

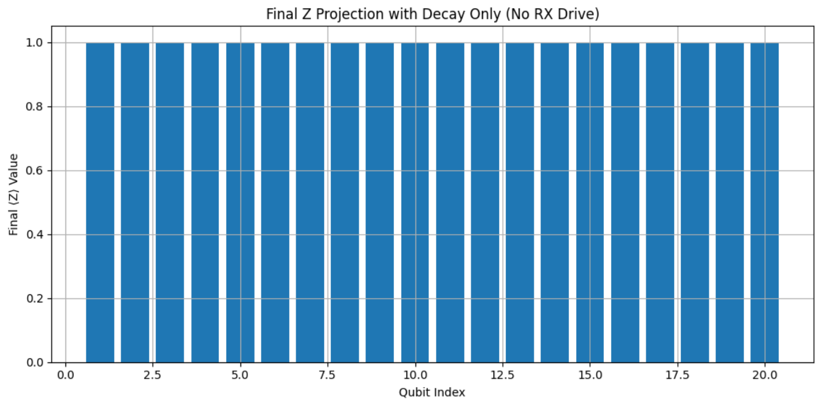

Figure 2: Decay-only simulation: all qubits remain at $\langle Z \rangle \approx +1$, confirming RX's role in collapse.

This unique behavior likely arises from a combination of:

- Photon energy scale tuned to compressed gold orbital transitions
- Periodic refresh intervals that entrain decay events
- Collective optical field effects within the diamond lattice

Such stabilization offers a powerful alternative to cryogenic quantum error correction. Further study is warranted to determine if this synchronization extends to entangled states, cluster logic, and logical gates.

Acknowledgments

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Appendix: Simulation Scripts and Parameters

All simulations are publicly available at: `https://github.com/EricRuecker/GoldCoreX`

- `goldcorex_100qubit_realistic_flip.py` – synchronized RX collapse
- `goldcorex_decay_only_control.py` – RX-free benchmark

- `goldcorex_apocalypse_decoherence_test.py` – system threshold test