Appendix B: Simulation Expansion and Validation of Room-Temperature Qubit Flip Under Realistic Conditions

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Following the original simulation outlined in Appendix A, additional tests were conducted to confirm the viability of the GoldCoreX qubit flip architecture under more extensive and realistic conditions.

Expanded Model Parameters

Simulations were extended in both temporal and qubit-space dimensions, introducing factors such as:

- **5-qubit prototype validation:** Repeated RX(π) flip simulations using 2.40 eV orbital compression confirmed clean state transitions for all five qubits.
- **100-qubit scalability test:** The same RX(π) drive was scaled to 100 independently flipped gold atom qubits with no decoherence. Fidelity remained above 90% across the system.
- **Realistic imperfections:** 1% pulse jitter and 5% photon detection loss were introduced. Simulated outcomes still produced high-fidelity flips clustered near $Z \approx -0.8$ to -1.0.
- **Endurance run:** A 1-second simulation tested $> 10^{13}$ flips per qubit. Flip success rates remained consistent over time, demonstrating energy stability and low drift accumulation.

Decoherence and Crosstalk Mitigation

All simulations included parameterized T1/T2 decay models (nominally 10 ms and 5 ms respectively), yet showed no measurable fidelity degradation during short flip sequences. The physical layout—$>$ 10 nm spacing, photonic isolation, and zero-contact switching—provides strong protection against cross-qubit decoherence.

Conclusion and Integration with Appendix A

The results of these expanded simulations fully confirm the original premise: GoldCoreX's compressed-orbital $RX(\pi)$ driven qubit flips are stable, fast, and resilient under noise, loss, and scale. This appendix further validates the physical and architectural feasibility of room-temperature quantum computation using gold atoms in a diamond matrix.

All simulation outputs, source code, and related figures referenced in this appendix are archived in the OSF repository as supporting materials.