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Logical Qubits vs. TQC Kurtbits: A Comparative Analysis of Quantum Computation Paradigms

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Abstract:

This paper explores the conceptual and technical differences between logical qubits in standard quantum computing and the kurtbit-based model of Twin Quantum Computing (TQC) rooted in the NMSI (New Mechanics of Subquantum Information). We provide an in-depth clarification of what logical qubits are, how they relate to physical qubits, and the essential role they play in current fault-tolerant quantum computing. Furthermore, the paper contrasts this architecture with the emerging TQC model, which does not rely on quantum entanglement or low-temperature stabilization but instead uses stabilized logical oscillations in informational vacuum. Through detailed comparison tables, we present arguments for why TQC offers a fundamentally different and potentially more robust approach to subquantum-level computation.

Keywords:

1. Logical qubit
2. Physical qubit
3. Quantum error correction
4. Quantum decoherence
5. Stabilizer codes
6. Surface code
7. Topological qubit
8. Kurtbit
9. Subquantum oscillatory computing
10. TQC (Twin Quantum Computing)
11. Subquantum coherence
12. Quantum information theory

1. Introduction

Quantum computation has progressed from theoretical models to practical devices, with companies like IBM and Google developing quantum processors with dozens or hundreds of physical qubits. However, a critical challenge remains: physical qubits are unstable, highly error-prone, and difficult to scale. To address this, researchers introduced the concept of **logical qubits**, abstract computational units built from multiple physical qubits using quantum error correction codes.

In parallel, a new conceptual framework—TQC (Twin Quantum Computing)—proposes a radically different foundation for quantum computation, based on subquantum informational oscillations and kurtbits rather than traditional qubits. TQC is part of the NMSI paradigm, which redefines particles not as points or waves, but as stabilized logical oscillations in the informational vacuum.

2. What Are Logical Qubits?

Logical qubits are high-level representations of quantum information designed to be robust against decoherence and noise. A single logical qubit may be constructed from dozens or even thousands of physical qubits. The relationship between them is maintained through error correction protocols, such as the surface code.

Key characteristics:

- Built from multiple entangled physical qubits.
 - Require precise control and measurement hardware.
 - Highly dependent on environmental isolation and cryogenic conditions.
 - Dependent on error correction codes to function.
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3. Virtual Quantum Computation: A Return to Algorithmic Abstraction?

While quantum hardware struggles with stabilization, much of the progress in quantum algorithms is being simulated on classical machines using "virtual" qubits. Logical qubits, in this sense, represent an abstraction—a return to an algorithmic logic detached from physical reality. However, this abstraction still depends on physical layer constraints that make scalability and real-world implementation extremely difficult.

4. TQC and Kurtbits: A New Subquantum Paradigm

TQC eliminates the need for entangled qubits or cryogenic stabilization. It proposes a different model altogether, using Kurtbits (Kurtoscillatory units) within a system of stabilized logical oscillations. These do not rely on physical qubits or probabilistic wavefunction collapse.

Core principles of TQC:

- Computation is performed through stabilized oscillatory interference patterns.
- Uses a third component (dynamic zero) in addition to binary oscillatory states.
- Works at room temperature.
- Logical consistency is maintained through resonant subquantum structure.
- Does not require quantum error correction codes.

5. Comparative Table

Feature	Logical Qubits (Standard QC)	Kurtbits (TQC Model)
Based on	Entangled physical qubits	Stabilized subquantum oscillations
Temperature requirement	Near absolute zero	Room temperature
Error correction	Mandatory (Surface Code, etc.)	Intrinsic stability through resonance
Computation mechanism	Superposition & entanglement	Interference of oscillatory logical states
Physical substrate	Superconducting circuits, ion traps	EMF-encoded logic centers (CLO structures)
Collapse and measurement	Probabilistic, destructive	Non-invasive feedback/resonance reading
Third component (zero-point)	Not present	Yes – "Dynamic Zero" Kurtbit core

6. Conclusion

Logical qubits are a necessary abstraction in current quantum computing to combat instability, but they do not solve the root limitations of the qubit-based paradigm. In contrast, TQC offers a revolutionary rethinking of computation based on subquantum informational physics, with potential applications in medicine, cosmology, and beyond. While the TQC model is in its infancy, it promises a radically simpler, stable, and scalable path toward true quantum computation.

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