

Research Article

## Innovative Orbius Path Design in Quantum Chips: Their Interrelation in Quantum Physics and Scalable Quantum Computing

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Article History	Abstract
<p><b>Received:</b> April 13, 2026 <b>Accepted:</b> May 03, 2026 <b>Published:</b> May 09, 2026</p>	<p>This research introduces our innovative concept of using Orbius Path [1] and road path possibilities within quantum dynamics, in the broader context of quantum physics and quantum chip design. We emphasize that our innovative Orbius structural and topological properties of electron density distributions, together with trajectory-based descriptions of quantum behavior, offer a useful framework for understanding the physical requirements of next-generation quantum hardware. By integrating ideas from quantum chemistry, condensed matter physics, and quantum information science, our research introduces how static Orbius-Orbital-Bonding Topology and dynamic particle pathways may jointly influence coherence, entanglement, teleportation, and computational stability in quantum devices. The central premise of this research paper is that quantum chips require not only advanced fabrication techniques but also deeper theoretical insight into the behavior of matter at the nanoscale. In particular, our research study considers Orbius Orbital Bond Path in quantum chips can be used as a theoretical lens for examining electron transport, local bonding environments, and interconnectivity in quantum systems. At the same time, road path dynamics, understood through path-integral reasoning, offer a complementary way of describing the probabilistic motion of particles and the range of possible quantum trajectories. Together, these two perspectives suggest a dual framework Orbius Topological Pathway [1] for analyzing all possible quantum trajectory pathway between path-integral trajectory at atomic-scale structure and bonding topology device-level with quantum dynamics performance in quantum chips design. In addition, this research paper further proposes Orbius Orbital Path Engineering as a conceptual approach for designing quantum computing chips with enhanced stability, coherence preservation, and scalability. Our innovative Orbius Framework aims to provide a theoretical contribution to quantum device architecture by linking topological electron density analysis with the practical needs of qubit (1, 0 and 0, 1) systems. Our research study therefore offers a multidisciplinary perspective on how quantum bonding, pathway dynamics, and nanostructured materials may inform future developments in high-performance quantum processors.</p> <p><b>Keywords:</b> Orbius Path, Orbius Topological Pathway, Path-Integral Trajectory, Bonding Topology, Quantum Dynamics, Quantum Chips, Quantum Trajectory Pathway, Quantum Integrated Circuits,</p>

### Introduction

The rapid development of quantum computing has intensified the search for materials, architectures, and theoretical models capable of supporting stable and scalable qubit systems. Unlike classical semiconductor devices, quantum chips operate in regimes where coherence, decoherence, entanglement, and tunneling are central physical concerns [2][3]. As a result, the design of quantum hardware depends not only on engineering precision but also on a refined understanding of matter at the quantum level. In this context, our innovative

concepts from quantum chemistry and quantum topology may offer valuable insights into the electronic and structural conditions that support device performance.

One challenge in quantum chip development is the fragility of qubit states, superconducting circuits, trapped ions, spin qubits, and photonic qubits each require highly controlled environments to maintain quantum coherence long enough for computation. Even small disturbances from thermal noise, material defects, or imperfect interfaces can degrade performance. This challenge has encouraged researchers to explore whether new theoretical frameworks, beyond conventional device physics, can help explain or improve the internal organization of quantum systems.

Our innovative present study introduces Orbius Orbital Bond Path and road path dynamics as complementary conceptual tools. Orbius Orbital Bond Path Theory is treated here as a topological description of electron density and bonding relationships within a system. Road path dynamics, by contrast, refers to the range of possible quantum trajectories that particles may follow according to path-integral thinking. The purpose of combining these ideas is not to collect them into one theory, but to use them jointly as a framework for understanding how static structure and dynamic behavior interact in quantum materials and quantum devices.

### **Theoretical Framework Suggestion**

Our innovative theoretical suggestion is that bonding is not simply a matter of classical attraction between fixed particles. Instead, the distribution of electron density shows the actual organization of atoms and interactions within a system. Topological approaches, such as the Quantum Theory of Atoms in Molecules, emphasize the importance of electron density structure in identifying bond characteristics, atomic basins, and regions of stability. From this perspective, our innovative Orbius Path and Orbius Orbital Bond Path designs can be understood as a state of coherence matchup in  $(1, 0 \text{ at } 0, 1)$  associated with electron-density connectivity, indicating how atomic regions are organized through quantum-mechanical road-path (Orbius) interactions.

This topological view is useful for thinking about materials used in quantum computing. The physical behavior of qubits is shaped by the microscopic arrangement of atoms, defects, impurities, and interfaces. If the local bonding environment is unstable, quantum states may become more vulnerable to decoherence. Conversely, a more coherent and well-organized bonding structure such as (our innovative Orbius Path) may support better electrical transport, lower noise, and improved device integrity. Orbius Path and Orbius Orbital Bond Path therefore offers a possible way of examining whether material structure can contribute to more favorable quantum behavior.

Therefore, our innovative Orbius Road-Path Dynamics provide a complementary dynamic perspective. In quantum mechanics, particles do not follow one simple deterministic path. Instead, their behavior is described by probabilities across many possible trajectories. Our innovative Orbius Path Integral Formulation captures this idea by treating quantum evolution as a sum over all possible. This approach is especially valuable when considering how particles move through nanostructures, interfaces, or quantum circuits where classical motion is inadequate as a description.

The combination of these two ideas is theoretically significant. Orbius Orbital Bond Paths represent the structural conditions under which quantum behavior emerges, while road paths represent the dynamic routes through which quantum processes unfold. Our unified framework that takes both into account may help explain how local electronic structure influences coherence, tunneling, transport, and qubit interaction. For quantum chip research, this means the internal architecture of materials may be studied not only as a static design problem but also as a dynamic quantum system, for next-generation quantum chips.

### **Suggestion: Innovative Quantum Chip Design**

Quantum chips are among the most technically demanding systems in modern science and engineering. Their performance depends on the careful control of quantum states, the suppression of error, and the preservation of delicate superposition and entanglement properties. Unlike conventional microchips, quantum chips cannot tolerate the same degree of structural imperfection because their operating principles depend directly on quantum behavior. Any useful theory of quantum chip design must therefore account for both material structure and quantum dynamics.

So, our innovative Orbius Path, Orbius Orbital Bond Path Engineering, as proposed in this research study, suggests that the microscopic arrangement of electron density may be relevant to chip stability and functional

performance. At the material level, electron transport pathways influence conductivity, resistance, and coupling behavior. At the device level, these factors shape how qubits interact with each other and with their surrounding environment. If a material's bonding topology is more favorable, it may reduce unwanted scattering, support better coherence, and improve interconnectivity among circuit elements. Our innovative Orbius Path design is especially relevant in systems such as superconducting quantum circuits, quantum dots, and spin-based devices. These architectures rely on precise control over local interactions. Our innovative theoretical framework can links orbital organization to quantum transport may therefore be useful for selecting materials and designing structures with improved fidelity. This approach may help guide the search for more robust quantum chip configurations.

The notion of Road-Path Dynamics also matters for chip design because it reflects the uncertainty and multiplicity inherent in quantum motion. Charge carriers, photons, and spin states may all behave differently depending on geometry, material composition, and external fields. A path-integral perspective encourages researchers to consider not only the most likely state of a system, but the full range of possible quantum evolutions. This is valuable in device design because practical performance often depends on how a system behaves under fluctuating conditions.

Our major contribution to the Orbius Path Framework is that we attempt to bridge static and dynamic views of quantum systems. Traditional material analysis often separates bonding structure from transport behavior, even though the two are deeply connected. Our innovative Orbius Path and Orbius Orbital Bond Paths help identify where electron density is concentrated and how atoms are linked, while road paths help describe how particles propagate through the resulting structure. In combination, these concepts may improve our understanding of how materials support or obstruct quantum coherence.

This is important because coherence is the foundation of quantum computation. If a qubit loses coherence too quickly, computation becomes unreliable. Material defects, interface roughness, and environmental disturbances all contribute to this problem. From the perspective of road-path design, these issues may often happen in a conventional road-path system, which these conventional system interpreted as signs of structural instability or a weak structural system. From the perspective of road-path dynamics, they may appear as disruptions to the range of available quantum trajectories. So, our innovative Orbius Orbital Bond Path solution can provide an all-in-one solution. We provide two coherent states altogether in a richer (Orbius) account; as a result, quantum materials perform better than others. Our proposed framework also has implications for quantum simulation and modeling. Modern quantum devices often require simulations that can capture both electronic structure and device-scale behavior. If Orbital Bond Path methods are combined with trajectory-based quantum analysis, researchers may be able to create more informative models of material behavior at the atomic scale. Such models could support better predictions about tunneling, coupling, coherence, and entanglement dynamics (Appendix 1).

The conceptual idea of our innovative Orbius Path and Road Path proposes a dual function multi-layer framework for understanding quantum systems by integrating both structural and dynamic dimensions. Which can make (1,0 @ 0,1) interact together, at the same time at the same place to meet-up, at the certainly Orbius Path design. The Orbius Path characterizes the stable internal architecture of quantum matter, where electron density distribution and bonding topology establish structural coherence and define the system's physical integrity. In contrast, the Road Path captures the dynamic behavior of quantum states, illustrating how they propagate across multiple possible trajectories through mechanisms such as superposition and interference. Together, these two paths form an interconnected framework in which structural coherence and dynamic evolution are not independent but mutually influential. In the context of quantum chips, our innovative design has a dual perspective which offers a useful lens for explaining how material topology and quantum transport processes jointly determine key performance factors, including coherence time, qubit coupling strength, and overall device stability.

### **Innovative Formula**

The link between bonding topology, path dynamics, and chip performance:

$$Q_{\text{chip}} = \frac{B_{\text{orb}} \cdot R_{\text{path}} \cdot C_{\text{coh}}}{1 + D_{\text{error}}}$$

Where:

- $Q_{\text{chip}}$  = overall quantum chip effectiveness

- $\mathcal{B}_{\text{orb}}$  = orbital bond-path stability
- $\mathcal{R}_{\text{path}}$  = road-path quantum propagation efficiency
- $\mathcal{C}_{\text{coh}}$  = coherence preservation factor
- $\mathcal{D}_{\text{error}}$  = decoherence and interruption factor

Orbius theoretical version is:

$$\Psi_{\text{total with } (1,0 \text{ \& } 0,1)} = \sum \mathcal{T}_{\text{orb}}(r) \exp \int \left( \frac{i}{\hbar} S[\text{Path}] \right) dP$$

This expresses the idea that the static orbital topology  $\mathcal{T}_{\text{orb}}(r)$  interacts with the action over all possible paths  $S[P]$ , which is closer to the conceptual bridge between bond structure and quantum trajectories. Which the above, the Orbius Bond Path provides a topological representation of quantum structural stability, whereas the Road Path captures the probabilistic evolution of quantum states; together, they offer a unified framework for analyzing coherence, transport, and information flow in quantum chip systems.

### Innovative Orbius Path Methodological Direction

Our innovative theoretical synthesis would define the relationship between orbital structure and particle trajectories in quantum materials. Computational modeling could then be used to explore how different structural conditions affect transport, stability, and coherence.

A more of the study might involve atomistic simulation when they interact, within the Orbius Path which because the road path can be interact in between the all possible pathway, so 1, 0, and, 0, 1, must be interact at the same time, with using our innovative Orbius Path method, so no matter in which density function, or other quantum mechanical modeling the Orbius Path will be a possible tools that can collect all possible outcome in one place and at the same time. Which mean at the Orbius Path, they (1, 0 @ 0, 1) will meetup one day. Our Orbius Path methods could help the computer industry in future quantum chips design, we provide a certain bonding patterns which will certainly coherence and correlate with favorable electronic properties for quantum hardware. Such our innovative Orbius Path design would certainly contribute to the industry.

### Conclusion

This research paper has presented the original innovative design by using Orbius Path and Orbius Orbital Bond Path ideas into future quantum chips design. The central claim is that static bonding topology and dynamic quantum trajectories may together offer a useful lens for understanding quantum chip behavior. In this framework, orbital bond paths represent the structural organization of electron density, while road paths represent the range of possible quantum evolutions that influence device performance. This research study also, suggests that this dual perspective may be useful for building up, coherence, transport, entanglement, and material stability in quantum computing systems. In between 1,0 and 0,1, which they can co-exist when using our innovative Orbius Path and Orbius Orbital Path quantum chips design, although the framework remains theoretical and requires further refinement, we offer a multidisciplinary basis for connecting quantum physics, quantum chemistry with quantum hardware design. By structuring the domain system formally, our innovative Orbius Method offers a more solid foundation for future use. I hope my research paper can benefit society and humanity (Appendix 2).

### Declarations

**Acknowledgments:** The author would like to acknowledge the independent nature of this research, which was conducted without institutional or external support.

**Artificial Intelligence (AI) Use Statement:** The author confirms that artificial intelligence was not used to generate the research content.

**Author Contribution:** The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

**Conflict of Interest:** The author declares no conflict of interest.

**Consent to Publish:** The author agrees to publish the paper in International Journal of Recent Innovations in Academic Research.

**Data Availability Statement:** All relevant data are included in the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** Not applicable.

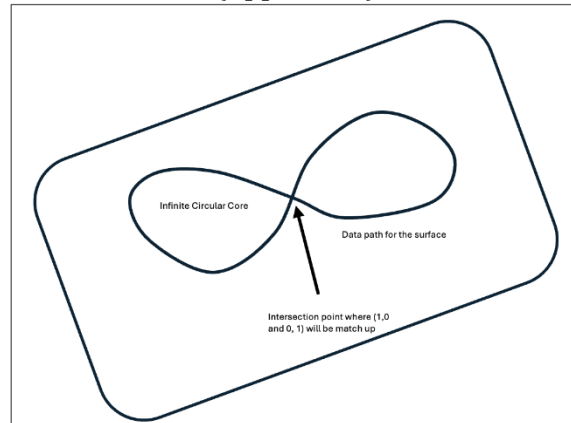
**Informed Consent Statement:** Not applicable.

**Research Content:** The research content of the manuscript is original and has not been published elsewhere.

## References

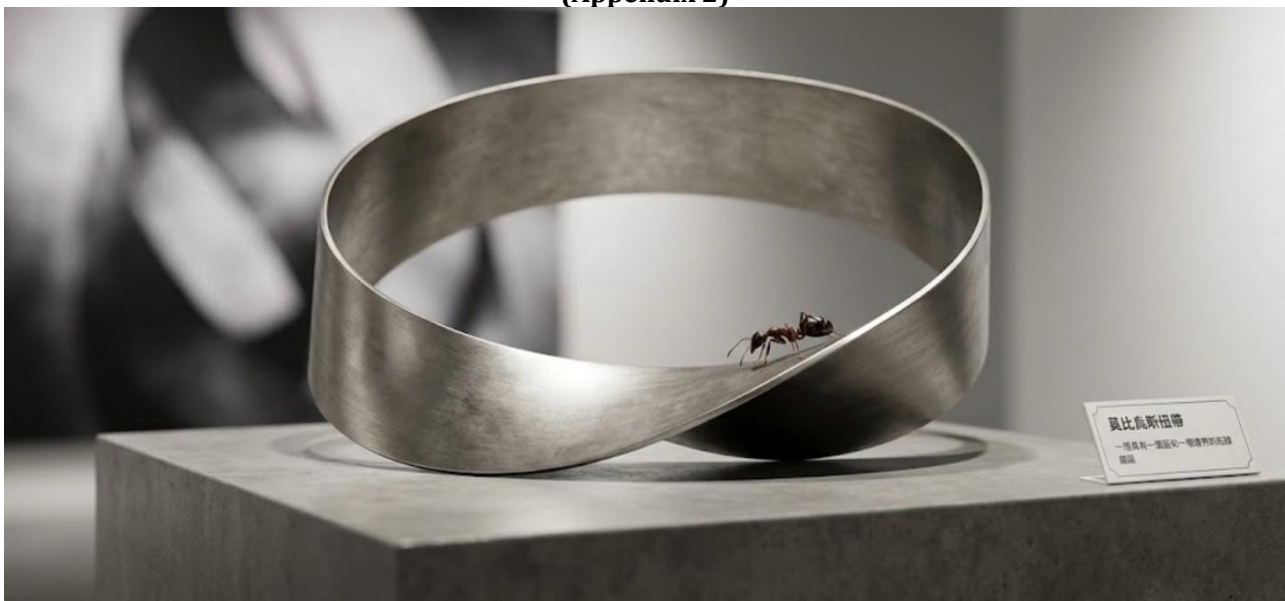
1. Lie, C.P. 2025. Orbis bond path, road path, and their interrelation in quantum physics and quantum chips. International Journal of Recent Innovations in Academic Research, 9(3): 163-166.
2. National Academies of Sciences, Engineering, and Medicine. 2019. Quantum computing: Progress and prospects. The National Academies Press. <https://doi.org/10.17226/25196>.
3. Shor, P.W. 1994, November. Algorithms for quantum computation: Discrete logarithms and factoring. In: Proceedings 35th annual symposium on foundations of computer science (pp. 124-134). IEEE.

### (Appendix 1)



**Figure 1.** Innovative Orbis road-path quantum chips model operation framework (Author's view).

### (Appendix 2)



**Figure 2.** My design was inspired by the following artwork (Source: Image retrieved from online sources).

**Citation:** Lie Chun Pong (李震邦). 2026. Innovative Orbis Path Design in Quantum Chips: Their Interrelation in Quantum Physics and Scalable Quantum Computing. International Journal of Recent Innovations in Academic Research, 10(2): 72-76.

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