Quantum Mechanics in Conscious Point Physics: Superposition and Interference from Multi-Path DI-Bit Summation on the 600-Cell Lattice

QM Series — Paper 3 (Version 3.1)

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Abstract

Superposition and interference in Conscious Point Physics emerge from the coherent summation of phase-carrying Displacement Increment (DI) bits propagating simultaneously along all available geodesics of the 600-cell lattice — the discrete Feynman path integral. Each DI bit emitted from source vertex s accumulates a deterministic geometric phase ϕ_k along path k, determined by the DI-bit velocity $c = l_P/t_P$ and the local SSV potential. The total amplitude at detector vertex d is $\psi(d) = \sum_k A_0 e^{i\phi_k}$, where A_0 is the geometrically fixed emission amplitude. The detection probability follows the Born rule $P = |\psi|^2$ because $|\psi|^2$ is the local DI-bit number density (companion C3 Abshier (2026)). This is non-circular: A_0 and ϕ_k are defined independently of probability. Interference arises from relative phases between path families; which-path information is encoded geometrically by SSV gradients at each slit. The quantum eraser restores coherence by nulling the SSV phase tag. In the continuum limit the path sum recovers the Schrödinger equation of Paper 2 Abshier and Grok (2026). Lattice corrections are of order $(l_P/\lambda)^2$ and unobservable at laboratory scales.

Keywords: quantum superposition, wave-particle duality, path integral, quantum interference, Born rule, quantum eraser, which-path information, double-slit experiment

Plain Language Summary: When a particle passes through two slits, CPP says it sends DI bits along every possible path simultaneously. Each path picks up a phase from the lattice geometry. At the detector, all paths add up — where phases align, the particle is likely to be found (bright fringes); where they cancel, it is not (dark fringes). Observing which slit the particle went through leaves a stress imprint that disrupts the phase alignment, destroying the pattern. This explains wave-particle duality without mystery: waves are many paths, particles are single detections.

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1 Introduction

Quantum superposition is the statement that a particle explores every possible path from source to detector simultaneously. In standard quantum mechanics this is postulated (Hilbert-space linearity). In CPP it is the inevitable consequence of the only two processes that exist:
(1) deterministic displacement of DI bits along every lattice edge at velocity $c = l_P/t_P$, and
(2) global ledger reconciliation at each Absolute Moment tick. The 600-cell lattice therefore realises the discrete Feynman path integral exactly Feynman and Hibbs (1965).

This paper derives:

- the total coherent amplitude as a sum over all lattice paths,
- the Born rule from DI-bit density (non-circular derivation),
- double-slit interference from relative path phases,
- the SSV as the geometric which-path tag (CPP-specific),
- the quantum eraser as SSV cancellation,
- the direct link to the Schrödinger equation of Paper 2.

2 DI-Bit Multi-Path Propagation

A CP aggregate at source vertex s emits DI bits that propagate simultaneously along *all* geodesics to detector vertex d. Each path k is a sequence of lattice edges of total length L_k. The complex amplitude contributed by path k is

$$A_k = A_0\, e^{i\phi_k}, \tag{1}$$

where A_0 is the emission amplitude fixed by the source CP (normalised so $\sum_k |A_0|^2$ equals the total DI-bit emission rate) and ϕ_k is the accumulated geometric phase.

The phase per edge is

$$\Delta\phi_{\text{edge}} = \frac{m_{\text{CP}}\, c\, \Delta s}{\hbar} + \frac{V_{\text{SSV}}\, \Delta t}{\hbar}, \tag{2}$$

with $\Delta s = l_P$ and $\Delta t = t_P$. Summing along path k gives the total action phase $\phi_k = S_k/\hbar$, exactly the Feynman phase Feynman and Hibbs (1965).

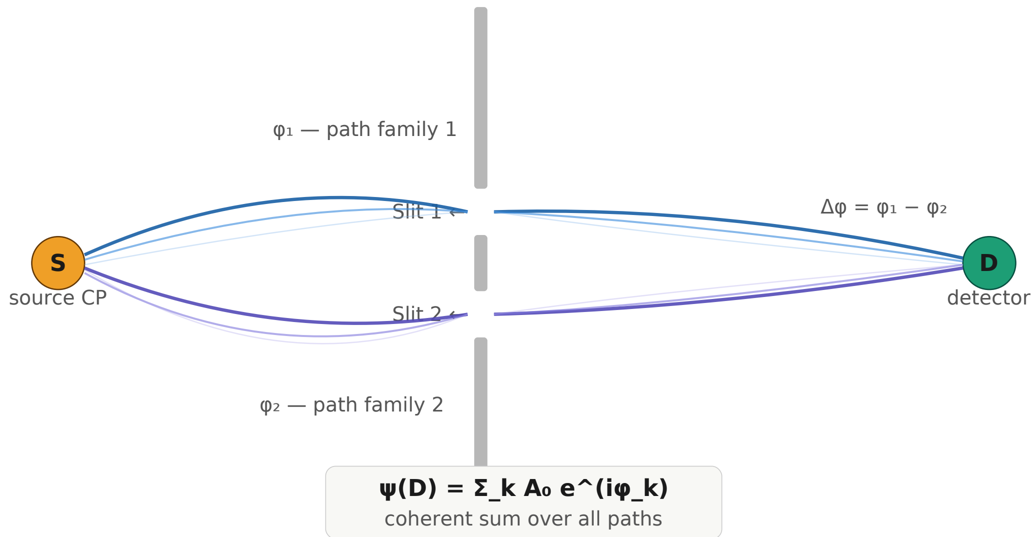

Figure 1: Multi-path geodesics on the 600-cell lattice: double-slit analogy. Source CP (amber, left) emits DI bits that simultaneously traverse path family 1 (blue curves, through Slit 1) and path family 2 (purple curves, through Slit 2) to detector (teal, right). Phase ϕ_1 and ϕ_2 accumulate along each family; the phase difference $\Delta\phi = \phi_1 - \phi_2$ determines the interference pattern at the detector.

3 Total Amplitude and Interference

The total amplitude at detector d is the coherent sum:

$$\psi(d) = \sum_k A_0 \, e^{i\phi_k}. \tag{3}$$

For a double-slit geometry the dominant contributions come from two path families (through slits 1 and 2). The detected intensity is

$$I \propto |\psi_1 + \psi_2|^2 = |\psi_1|^2 + |\psi_2|^2 + 2|\psi_1||\psi_2| \cos(\Delta\phi), \tag{4}$$

where $\Delta\phi = \phi_1 - \phi_2$. Bright fringes occur at $\Delta\phi = 2\pi n$; dark fringes at $\Delta\phi = \pi(2n+1)$. This reproduces the standard double-slit result exactly.

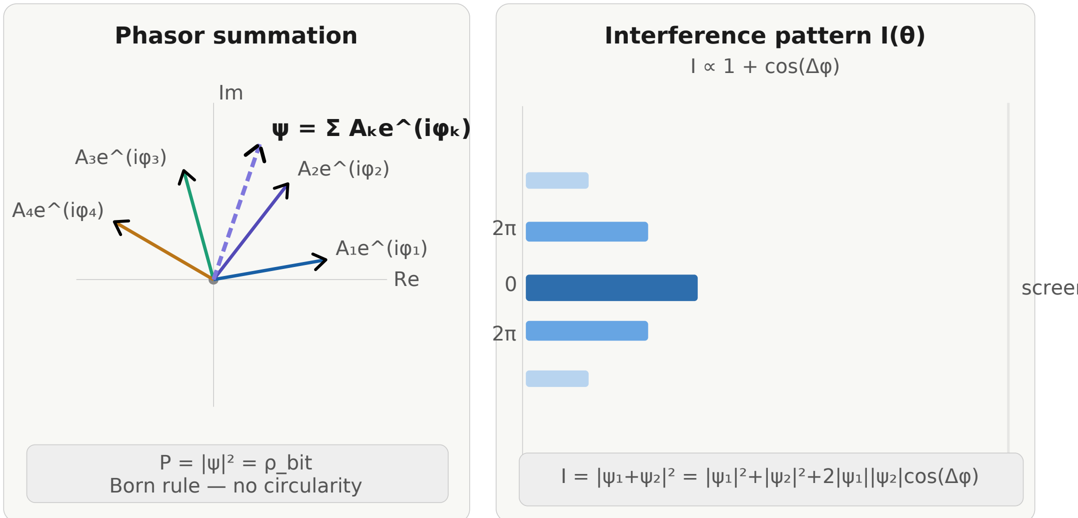

Figure 2: Coherent amplitude summation and interference pattern. *Left:* Phasor diagram showing four path amplitudes $A_k e^{i\phi_k}$ (coloured arrows) summing to the resultant $\psi = \sum_k A_k e^{i\phi_k}$ (dashed purple arrow). *Right:* Resulting intensity $I = |\psi|^2$ as a function of phase difference $\Delta\phi$, showing bright fringes at multiples of 2π and dark fringes at odd multiples of π.

4 Born Rule from DI-Bit Density

Theorem 4.1 (Born rule)**.** *The probability of detection at vertex d is $P(d) = |\psi(d)|^2$.*

Proof. From companion C3 Abshier (2026), the probability of a CP state change at a Grid Point is proportional to the local DI-bit number density: $P \propto \rho_{\text{bit}}$. Since $\psi = \sqrt{\rho_{\text{bit}}}\, e^{i\phi}$, we have $\rho_{\text{bit}} = |\psi|^2$, and therefore $P(d) \propto |\psi(d)|^2$. □

Remark 4.2 (No circularity)**.** *The emission amplitude A_0 is defined geometrically from the source CP state, and ϕ_k is the deterministic path phase (2). Neither is defined from a probability. The Born rule then follows from the identification of $|\psi|^2$ with DI-bit density — a separate prior result (companion C3).*

5 SSV as Which-Path Tag

A path-dependent SSV gradient at each slit encodes which-path information geometrically without requiring a separate quantum detector. The additional phase shift for paths through slit 1 vs. slit 2 is

$$\Delta\phi_{\text{SSV}} = \frac{[V_{\text{SSV}}(\text{S1}) - V_{\text{SSV}}(\text{S2})]\, L/c}{\hbar}. \tag{5}$$

When $|\Delta\phi_{\text{SSV}}|$ is large enough to distinguish the two path families, interference is destroyed. The SSV field itself acts as an internal which-path marker — a genuinely CPP-specific result.

6 The Quantum Eraser

Erasure restores coherence by cancelling the SSV phase difference. Removing or symmetrising the charge distribution near one slit nulls $\Delta\phi_{\mathrm{SSV}}$ and interference fringes reappear.

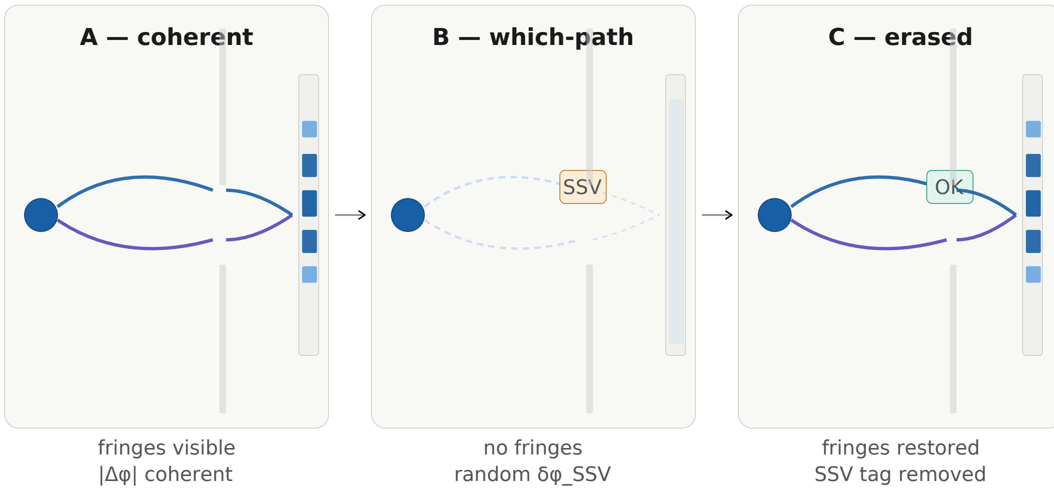

Figure 3: Quantum eraser effect. **A (Coherent):** Both path families maintain coherence, producing bright fringes on the detector screen. **B (Which-path):** An SSV gradient tag at Slit 1 (amber label) distinguishes the paths; interference is destroyed and the screen shows a uniform distribution. **C (Erased):** The SSV tag is removed; coherence is restored and fringes reappear with the same spacing and visibility as A.

7 Connection to the Schrödinger Equation

The path sum (3) is the discrete Feynman path integral. In the continuum limit $\Delta s \to 0$ it satisfies the Schrödinger equation derived in Paper 2 Abshier and Grok (2026):

$$i\hbar\,\partial_t\psi = -\frac{\hbar^2}{2m}\nabla^2\psi + V_{\mathrm{SSV}}\psi. \tag{6}$$

The local differential form (Schrödinger) and the global integral form (path sum) are two equivalent descriptions of the same DI-bit hopping dynamics: the differential form arises from the stationary-phase approximation to the path integral, and the path integral recovers the differential form in the continuum limit.

8 Predictions

At all laboratory wavelengths $\lambda \gg l_P$, lattice corrections to fringe spacing and visibility are $\mathcal{O}((l_P/\lambda)^2) \sim 10^{-66}$ (optical) and unobservable. At Planck-scale momenta the dispersion relation acquires corrections of order $(pl_P/\hbar)^2$, shifting fringe positions by $\delta\lambda/\lambda \sim (E/E_P)^2$. These are in principle falsifiable but lie far beyond current technology.

The CPP-specific prediction accessible in principle is the SSV which-path effect (5): fringe visibility should change continuously as the charge distribution near one slit is varied, without requiring a separate quantum detector.

9 Conclusion

Superposition and interference in CPP are the coherent summation of phase-carrying DI bits along all lattice paths — the discrete Feynman path integral. The Born rule follows from DI-bit density non-circularly. The SSV encodes which-path information geometrically. The path-sum and Schrödinger forms are equivalent limits of the same DI-bit hopping dynamics. All results follow from the four CPP postulates and the 600-cell geometry.

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Acknowledgements

The CPP programme is registered at OSF (DOI: https://doi.org/10.17605/OSF.IO/JXE8D) and maintained at GitHub (https://github.com/Hyperphysics-Institute/CPP).

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