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Φ BSU – Buoyant Separverse Unification – Field Theory, part I; Completing Relativity: A Topological Pinor Basis for Emergent Electromagnetism

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ΦBSU – Appendix B

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1 Spinor–Clock Thought Experiment and Field-Coherence Logic

1.1 Conceptual Setup

Consider two identical *spinor clocks*: local oscillators whose tick is the π -parity flip of a reference spinor ψ_0 . The clocks

1. start co-located and phase-locked, $\Phi_1 = \Phi_2$;
2. follow distinct world-lines γ_1, γ_2 ;
3. reunite and compare accumulated tick counts.

In our framework each world-line segment carries two logically separate data streams:

quantity	carrier	role
global phase grad. $\nabla\alpha$	$\Phi = e^{i\alpha}$	Weyl-scale $\rho(x) = \ \nabla\alpha\ $ sets tick <i>rate</i>
spinor direction ψ_0	$SU(2) \subset \text{Spin}(3, 1)$ frame	chooses <i>which</i> parity branch (\pm)

1.2 Case A: Clocks Remain Causally Linked

As long as each clock stays inside the others' future light-cone within a time $\ll \rho^{-1}$, a web of neutral 0-fibres continuously shuttles phase information between the two Klein-bottle sheets. The intersection condition enforces an *antipodal lock*

$$\left[\psi_0^{(1)}(\tau), \psi_0^{(2)}(\tau) \right] = \text{antipodal} \quad \forall \tau.$$

Operationally:

- A single flip registered by clock 1 would appear to clock 2 as an illegal flip on the opposite sheet unless clock 2 performs the conjugate flip itself.
- The joint state is limited to the two-sheet geometry; the number of independent observables is reduced by one conjugate pair, reproducing the Heisenberg bound $\Delta q \Delta p \geq \hbar/2$ as a *history-counting* effect.

1.3 Case B: Non-causal Separation

If γ_1 and γ_2 become space-like separated for a macroscopic proper time ΔT , neutral fibres cannot enforce the lock. Each spinor direction ψ_0 may rotate freely in $SU(2)$ without energetic cost while the individual tick rate is still set by the scalar $\rho(x)$.

Upon reunion the clocks may differ by an additional half-parity. Summary comparison:

	Causal link	No causal link
tick correlation	parity preserved	parity free to drift
superposition stability	inhibited	allowed
measurement spread	$\Delta q \Delta p \geq \hbar/2$	classical mix until sync

1.4 Implications for Macroscopic Decoherence

A composite object with $N \gg 1$ internal null-fibres has a neutral link mesh scaling as N^2 ; the probability of *all* links escaping causal reconnection behaves as $\sim e^{-N}$. Hence macroscopic bodies all but never form stable superpositions, whereas a single spin- $\frac{1}{2}$ or photon path can.

1.5 Relation to Other Language

- **Twin paradox** is recovered: clocks differ by the ρ -weighted proper time plus a possible half-parity slip for space-like detours.
- **Bohmian preferred foliation** is replaced by the global pinor sheet: causal contact chooses the allowed sheet.
- **Lorentz covariance** remains intact— $\nabla\alpha$ is a scalar, ψ_0 transforms in the usual spin representation; constraints activate only when null-fibres reconnect events.

1.6 Minimal Take-away

Local *tilt* (spinor direction) is free to rotate, but the *global* gradient $\nabla\alpha$ fixes the clock-rate scalar ρ . When null-fibres knit two regions together, parity branches are locked antipodally, yielding the uncertainty principle. Outside causal contact the lock opens and distinct "tick counts" merely record independent world-tube histories without violating Lorentz symmetry.

Electromagnetic twist-wave. In this context, we will also examine how an electromagnetic wave can form in the Φ BSU total unification field. The global phase bundle $\Phi(x) = \exp[i\alpha(x)]$ carries a closed one-form $A = \Phi^{-1}d\Phi = d\alpha$. When two antipodal 0-fibres are displaced by a net phase offset $\Delta\alpha(\tau)$, the ensuing *twist wave* is described by

$$F = dA = d(d\alpha), \quad \mathbf{E} = -\nabla\dot{\alpha}, \quad \mathbf{B} = \nabla \times \nabla\alpha, \quad \square\alpha = 0.$$

The local amplitude is not a free parameter but the coherent *count* of focused 0-fibres, $A_{\text{mac}} = p f c A_{\text{P}}$, with Planck-level single-fibre twist $A_{\text{P}} = \dot{\alpha}_{\text{P}}$. Energy oscillates between $U = \frac{1}{2}|\nabla\alpha|^2$ and $K = \frac{1}{2}|\dot{\alpha}|^2$, exactly as in a harmonic oscillator, while the antipodal link fixes a loss-free $\omega = 2\pi/\lambda$ ($\lambda =$ separation wavelength in Separverse). Detailed spin- $\frac{1}{2}$ fibre locking (opposite-handed 3-form screw bundles binding the 1-form phase line) is developed in Part III; here we note only that every photon is a single topological twist-unit ($\Delta\alpha = \pi$) carried by one pair of antipodal 0-fibres propagating with Poynting vector $\mathbf{S} = \mathbf{E} \times \mathbf{B}$.