Section T-3 — Transport, Parallel Flow & Manifold Dynamics of Tensors

The main dynamical evolution law of CUWF Tensor Field Theory

T-1 built the index and metric machinery required for tensor manipulation on the CUWF manifold. T-2 then defined the Stability Tensor T^{IJ} as the object that measures eigen-curvature, soft-mode activation, and the threshold between stable collapse and quantum emergence.

T-3 now upgrades the C-3 operator framework into full covariant evolution on the CUWF manifold. Instead of treating collapse as a discrete update or a probabilistic jump, this section expresses tensor dynamics as continuous geometric transport along entropic curvature.

In CUWF, nothing jumps in the fundamental description, and nothing collapses discontinuously as a primitive event. What appears as collapse is the visible result of tensor flow through the manifold. What appears as tunneling is curvature-driven redirection. What appears as entanglement is the growth of transport-induced tensor connectivity.

T-3.1 Covariant Transport Operator

Tensor transport along an entropic trajectory $X(\tau)$ is defined by the covariant transport operator:

$$D_\tau A^{IJ} = \partial_\tau A^{IJ} + \Gamma^I{}_K A^{KJ} + \Gamma^J{}_K A^{IK} \qquad (3)$$

The connection terms describe how the tensor changes because the underlying entropic manifold twists, shears, or rotates the available tensor directions.

Term	Role
$\Gamma^I{}_K$	Curvature-induced rotation of the tensor basis.
$\Gamma^J{}_K$	Shear or mixing of tensor directions.
$D_\tau A = 0$	Perfect parallel flow; no quantum shear has been initiated.

Transport should not be understood as ordinary movement through physical space. In C-4, transport means the way geometry changes the tensor itself as it is carried along an entropic trajectory.

Quantum activation begins when perfect parallel flow fails. Once the tensor can no longer remain parallel under transport, shear appears, soft directions rotate, and the system becomes capable of entering a quantum-active regime.

T-3.2 MAIN C-4 EVOLUTION EQUATION (Core Law)

Applying equation (3) to the Stability Tensor T^{IJ} gives the core evolution law of C-4:

$$D_\tau T^{IJ} = -\nabla^I \nabla^J E + \Gamma^{IJ}{}_K \partial_K E + \Lambda^{IJ} \qquad (4)$$

Expanding the covariant derivative yields:

$$\partial_\tau T^{IJ} = -\nabla^I \nabla^J E - \Gamma^I{}_K T^{KJ} - \Gamma^J{}_K T^{IK} + \Gamma^{IJ}{}_K \partial_K E + \Lambda^{IJ} \qquad (5)$$

Equation (5) is the evolution engine of CUWF Tensor Field Theory. It is the tensor-based generalization of the C-3 operator dynamics, but now written in fully covariant form.

Term	Dynamical Function
$-\nabla^I \nabla^J E$	Pure entropic curvature; drives collapse drift toward a basin.
Γ-terms	Parallel transport; produces mode rotation, shear, and curvature redirection.
Λ^{IJ}	Non-normal excitation; provides the ignition mechanism for tunneling and quantum activation.

This equation plays the role that Hamiltonian evolution plays in standard physical theory, but with a different foundation. It does not evolve a wavefunction through Hilbert space. It evolves a tensor field through entropic geometry.

The essential point is that collapse and quantum onset are not added as separate rules. They arise from the same covariant evolution equation: curvature pulls, transport rotates, and non-normal activation amplifies the soft mode.

T-3.3 Tensor Norm, Geodesics & Collapse Trajectories

To measure tensor magnitude on the entropic manifold, define the entropic norm:

$$||A||^2 = g^{IJ} g^{KL} A_{IK} A_{JL}$$

A perfectly geodesic tensor trajectory satisfies:

$$D^2_\tau X^I = 0$$

General collapse evolution is written as:

$$D^2_\tau X^I = -\nabla^I E + \Gamma^{IJ}_K T^{JK} \qquad (6)$$

The two terms have distinct physical meanings:

The first term pulls the system down the entropic gradient into a collapse basin.

The second term bends the trajectory through tensor curvature and becomes the precursor of quantum deflection.

Collapse is therefore not force-based in the Newtonian sense; it is entropic vector descent shaped by tensor curvature.

This is the dynamical bridge between T-2 and the later field equations. The Stability Tensor does not merely classify whether a state is stable or unstable. Through transport, it bends the path of the node itself.

T-3.4 Tensor Flux Conservation

Field consistency requires a divergence relation for the Stability Tensor:

$$\nabla^I T^{IJ} = J^J \qquad (7)$$

Here J^J is the tensor-flux current associated with cross-sector or cross-node exchange.

Case	Interpretation
$J^J = 0$	Pure classical collapse path; no active entanglement flux.
$J^J \neq 0$	Entanglement flux is present; tensor stress is being redistributed across sectors or nodes.
$\partial_\tau J \neq 0$	Coherence is growing; tunneling or collective activation becomes likely.

In this form, quantum behavior is not chance. It is tensor-flux imbalance. Once the divergence of the tensor field produces a nonzero current, the system is no longer an isolated basin descent. It has begun to exchange curvature information through the manifold.

T-3.5 Transport of the Entanglement Tensor Ξ^{IJ}

The link to T-5 can now be stated explicitly. The Entanglement Tensor is built from the Stability Tensor by metric contraction:

$$\Xi^{IJ} = g^{KL} T^{IK} T^{JL}$$

Its transport law follows directly from the transport of T^{IJ}:

$$D_\tau \Xi^{IJ} = 2 T^{K(I} D_\tau T^{J)}{}_K \qquad (8)$$

This relation gives the key dynamical statement of CUWF entanglement: Ξ grows only if T changes under transport. If the Stability Tensor remains geodesic and parallel, no entanglement growth is produced. If transport shears, rotates, or amplifies soft directions, Ξ grows as a derivative of instability flow.

Entanglement is therefore not measurement-collapsed and not random. It is the tensorial consequence of instability transport.

T-3 FINAL SUMMARY

Equation (5) is the main dynamical law of C-4:

$$\partial_\tau T^{IJ} = -\nabla^I \nabla^J E - \Gamma^I{}_K T^{KJ} - \Gamma^J{}_K T^{IK} + \Gamma^{IJ}{}_K \partial_K E + \Lambda^{IJ} \quad (5)$$

T-3 establishes that this law:

replaces the operator update structure of C-3 with covariant tensor evolution;

makes CUWF dynamics fully geometric and manifold-based;

separates classical collapse flow from quantum activation through transport and non-normal excitation;

shows that entanglement emerges from transport, not probability.

Single sentence essence:

Quantum behavior = curvature-driven tensor evolution, not measurement randomness.