Introduction

This paper develops the foundational mathematical structure of the Chayut Universe Wave Function (CUWF) theory. CUWF is built on a single scalar field (E(x,)) defined over a hybrid configuration manifold and an internal degree-of-freedom space. Its purpose is to construct a geometry and dynamics that do not depend on spacetime curvature as a primitive assumption, nor on Hilbert-space linearity as a foundational postulate. Instead, CUWF replaces these inherited structures with a unified entropic framework in which geometry, dynamics, collapse behavior, multi-node coupling, and stability arise from the internal structure of the entropic field itself.

The mathematical program of Paper C-2 proceeds through the following objectives.

Define the geometric domain

Section M-0 introduces the configuration space (C), the degree-of-freedom manifold (M_{}), and the derivative, tensor, and operator conventions required for the CUWF formalism. This section fixes the mathematical language of the paper before any dynamical operator is introduced. It defines the hybrid domain on which the scalar field (E(x,)) lives and prepares the notation needed for the later construction of entropic geometry and nonlinear evolution.

Introduce entropic geometry

Section M-1 constructs the entropic metric (g_E), together with the associated entropic gradient, divergence, Laplacian, and curvature tensors. Geometry in CUWF does not arise from an external spacetime manifold. It arises from the local structure of the entropic field itself, particularly through the Hessian and curvature-like response of (E). This section therefore establishes the first major mathematical claim of Paper C-2: geometry can be derived from entropic structure rather than assumed as a background.

Formulate the CUWF Master Operator

Section M-2 defines the nonlinear operator

[_E = *E E* - |*E*|^2 + *D*{}E,]

which governs the evolution of the entropic field. In the CUWF framework, this operator replaces both Einstein-type geometric equations and linear quantum operators at the foundational level. It combines entropic smoothing, nonlinear gradient suppression or amplification, and internal DOF deformation into one governing structure. The Master Operator is therefore the central mathematical object of Paper C-2.

Derive CUWF dynamics from a variational principle

Section M-3 formulates an entropic action functional whose Euler–Lagrange variation yields the CUWF Master Operator. This step is essential because it shows that the governing equation is not merely postulated. It can be derived from an action principle adapted to entropic geometry. The same action also provides a geometric derivation of collapse-node trajectories and clarifies the origin of future-vector deflection within the CUWF formalism.

Extend geometry to multi-node systems

Section M-4 constructs the multi-node manifold (M_N), the entropic Hamiltonian (H_{}), cross-curvature interactions, and the CUWF definition of entanglement as curvature inseparability. This section moves CUWF beyond single-node geometry and shows how multiple collapse nodes can become dynamically coupled through shared entropic curvature. Entanglement is therefore not treated as an algebraic tensor-product relation, but as an inseparability of curvature structure across the multi-node entropic manifold.

Establish the stability-spectrum theory

Section M-5 formalizes the Hessian-based stability operator, provides mode classification, and identifies the curvature-based criterion separating classical and quantum-like regimes. The eigenstructure of ((E)) becomes the key tool for determining whether a configuration behaves as a stable classical structure, an unstable transition mode, or a quantum-like boundary state. This section also provides the mathematical basis for the quantum–classical boundary within CUWF.

Map CUWF to existing physical theories

Section M-6 provides reduction limits showing how GR and QM/QFT arise as special cases of CUWF when curvature scales, noise scales, or linearization regimes dominate. In this view, conventional physical theories are not rejected; they appear as limiting projections of a deeper entropic-geometric structure. GR emerges when entropic geometry stabilizes into metric-like curvature, while QM/QFT arise when the dynamics of (E) admit effective linear or Hilbert-like approximations.

The results of Paper C-2 unify geometry, operator theory, variational principles, multi-node dynamics, entanglement structure, and stability into a single coherent mathematical system. This constitutes the first complete and rigorous formulation of CUWF as a mathematical physics framework.