Field Equations of the RSVP Framework

The Relativistic Scalar Vector Plenum (RSVP) framework models reality through scalar potential Φ, vector flow $\mathbf{v}$, and entropy density S fields. The evolution of the probability density $\rho[\Phi, \mathbf{v}, S]$ over field configurations follows:

$$\partial_t \rho = \nabla_u \cdot (D \nabla_u \rho) - \beta \nabla_u \cdot (\rho \nabla_u H),$$

where D is the diffusion tensor, β is a coupling constant, and H is the Hamiltonian functional.

The field equations, derived from a variational principle maximizing entropy, are:

Scalar Potential (Φ):

$$\partial_t \Phi = -\mathbf{v} \cdot \nabla \Phi + \kappa \nabla^2 \Phi - \lambda \frac{\delta S}{\delta \Phi},$$

where κ controls diffusion and λ couples to entropy.

Vector Flow ($\mathbf{v}$):

$$\partial_t \mathbf{v} + (\mathbf{v} \cdot \nabla) \mathbf{v} = -\nabla \Phi - \mu \nabla S + \nu \nabla^2 \mathbf{v},$$

where μ couples to entropy gradients and ν is viscosity.

Entropy Density (S):

$$\partial_t S + \nabla \cdot (S \mathbf{v}) = \sigma |\nabla \Phi|^2 + \tau |\mathbf{v}|^2 + \gamma \nabla^2 S,$$

where σ, τ, and γ govern entropy production and diffusion.

The Hamiltonian functional is:

$$H[\Phi, \mathbf{v}, S] = \int \left(\frac{1}{2} |\mathbf{v}|^2 + \frac{1}{2} |\nabla \Phi|^2 + S \log S + V(\Phi, S) \right) dV,$$

where $V(\Phi, S)$ encodes interaction potentials.

These equations provide a foundation for simulating RSVP dynamics and testing cosmological predictions.