Modal Flow Enrichment in Hont

Background

In our scalar-valued formulation of modal flow in Hont, the modal function was defined as:

$$\phi : X \times \mathbb{R}_\tau \to \mathbb{C}$$

This structure allowed us to extract meaningful ontological quantities such as:

- Mass (as the residue of a pole in modal frequency space)
- Electric charge (as phase winding number)
- Time (as continuity in modal flow τ)

Enriched Model

We now propose an enriched structure for the modal function:

$$\phi : X \times \mathbb{R}_\tau \to \mathbb{C}^n$$

where:

- $n \in \mathbb{N}$ is the dimension of internal degrees of freedom (e.g., flavor, spin)
- Each component ϕ_i evolves under the same modal principles: band-limited, residue-bearing, phase-structured

Purpose

This formulation aims to:

- Account for observed phenomena such as neutrino flavor oscillations without introducing "flavors of mass"
- Allow richer symmetry (e.g., $SU(n)$) while preserving:
  - Ontological mass structure (via eigenvalues of a mass matrix $\mathcal{M}$)
  - Phase-based charge conservation
  - Projection into $\mathbb{R}^4$ via Greens function convolution

Preservation

The $\mathbb{C}^n$-valued modal field retains:

- Greens function formulation with poles at physical masses
- Band limitation
- Scalar theory as a special case ($n = 1$)
- Topological interpretation of charge and mass

Next Steps

1. Explore the general structure of the mass operator $\mathcal{M}$
2. Quantify how projection kernels map enriched modal flow into observable fields
3. Extend this to include interactions and possibly spinor-valued fields

Status

Scalar-valued modal flow is not abandoned, but $\mathbb{C}^n$-valued flow is adopted as the **default formalism** for modeling systems with internal structure.