Derivation of Proton Mass from VAM First Principles Helicity in Vortex Knot Systems under the Vortex Æther Model (VAM)

Æther Dynamics Model (VAM)

Abstract

In the Vortex Æther Model (VAM), mass is not a fundamental input but an emergent quantity derived from vortex topology, circulation, and maximum force scaling. We present two derivations consistent with both Kelvin's vortex atom hypothesis and modern ætheric formulations.

1 Topological Swirl Energy and Vortex Mass

Consider the rotational energy density of a vortex core:

$$u = \frac{1}{2}\rho_{æ}\omega^2, \quad \omega = \frac{2C_e}{r_c} \tag{1}$$

The energy in a single vortex core of radius r_c is:

$$E_{\text{core}} = uV = \frac{1}{2}\rho_{æ}\left(\frac{2C_e}{r_c}\right)^2 \cdot \frac{4}{3}\pi r_c^3 = \frac{8}{3}\pi\rho_{æ}C_e^2 r_c \tag{2}$$

If the vortex structure has a topological linking number L_k, then total energy is:

$$E = \frac{8}{3}\pi\rho_{æ}C_e^2 r_c \cdot L_k \tag{3}$$

The mass is obtained by $M = E/c^2$:

$$M = \frac{8\pi\rho_{æ}C_e^2 r_c}{3c^2} \cdot L_k \tag{4}$$

2 Maximum Force and Planck Time Correction

We express $\rho_{æ}$ in terms of the maximum force $F_{\max}$ and C_e:

$$\rho_{æ} = \frac{F_{\max}}{r_c^2 C_e^2} \tag{5}$$

Substitute into the mass equation:

$$M = \frac{8\pi F_{\max}}{3c^2 r_c} \cdot L_k \tag{6}$$

To correct the mismatch with the observed proton mass, we introduce Planck time t_p as a quantum normalization:

$$M = \left(\frac{8\pi F_{\max} t_p^2}{3c^2 r_c} \right) \cdot \frac{L_k}{t_p^2} \tag{7}$$

The term in parentheses now becomes dimensionally consistent with observed mass when L_k is dimensionless and t_p acts as a quantum clock.

3 Alternative Derivation from VAM Constants

From dimensional construction using the fine structure of vortex geometry, we define:

$$\boxed{M = \frac{C_e c^3 t_p^2}{M_e r_c} \cdot \frac{I^{3/2}}{N \mu K^{1/2} \pi^{1/2}}} \tag{8}$$

Where:

- C_e = core tangential velocity
- c = speed of light
- t_p = Planck time
- M_e = electron mass
- r_c = vortex core radius
- I, N, μ, K = dimensionless symmetry and circulation parameters

This formulation captures Kelvin's idea of mass as a function of vortex complexity and æther elasticity.

Conclusion

The VAM framework allows a fully topological and mechanical interpretation of inertial mass. Depending on the choice of quantized circulation and linking, the known proton mass is recovered naturally.