Appendix: Nuclear Activation via Swirl Resonance in the Vortex Æther Model

Vortex Æther Dynamics

1. Overview

Recent experimental work on low-energy nuclear reactions (LENR), especially using reactions like $^{11}\mathrm{B}(d, n\gamma)^{12}\mathrm{C}$, reveals nuclear states that can be selectively activated using monoenergetic gamma beams. Within the Vortex Æther Model (VAM), these results are interpreted as *swirl resonance phenomena*, wherein specific angular frequency components of the injected field couple with vortex knot eigenmodes.

2. Swirl Resonance Yield

We model the activation yield Y_{VAM} as a spectral overlap:

$$Y_{\mathrm{VAM}} = \int_0^\infty \rho_{\mathrm{beam}}(\omega) \cdot \sigma_{\mathrm{knot}}(\omega)\, d\omega$$

Here:

- $\rho_{\mathrm{beam}}(\omega)$ is the angular frequency spectrum of the injected beam (gamma or ion-induced swirl),
- $\sigma_{\mathrm{knot}}(\omega)$ is the knot's absorption cross-section, modeled by:

$$\sigma_{\mathrm{knot}}(\omega) = \sum_n \frac{B_n \Gamma_n^2}{(\omega - \omega_n)^2 + \Gamma_n^2}$$

  where ω_n is the n^{th} knot mode, Γ_n is its linewidth, and B_n is the coupling strength.

3. Core-Shell Vortex Structure

Different gamma energies interact with different radial layers of the knot:

- 4.438 MeV photons $\rightarrow$ outer sheath Compton-like swirl scattering,
- 15.1 MeV photons $\rightarrow$ core-pair production and knot annihilation.

The knot cross-section becomes:

$$\sigma(\omega) = \sum_i \sigma_i(\omega) \cdot \Theta(r_i - r)$$

where each shell r_i absorbs distinct ω bands.

4. Swirl Rigidity and $Z_{\mathrm{eff}}^{(\mathrm{VAM})}$

The effective nuclear impedance in VAM becomes:

$$Z_{\mathrm{eff}}^{(\mathrm{VAM})} = \frac{P_{\mathrm{core}} \cdot r_c}{C_e \hbar}$$

mapping absorption behavior to Æther pressure properties.

5. Delayed Neutron Decay as Topological Swirl Collapse

The classic 6-group delayed neutron model maps to sequential vorticity leakage from nested shells:

$$\omega(t) = \sum_{i=1}^{6} \omega_{0i} e^{-t/\tau_i}, \quad \tau_i = \frac{r_i}{C_e}$$

Each decay constant corresponds to a specific radius r_i and swirl lifetime.

6. Experimental Confirmation

The presence of discrete gamma thresholds, delayed neutron curves, and resonance-specific yields all confirm the VAM prediction that:

- Knot excitation is frequency-selective.
- Fusion activation is not thermal but **topological and swirl-driven**.
- External fields must match the vortex eigenfrequency to unlock nuclear reactions.