Gauge-Orbit Rigidity Lemma Target

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Rigidity Functional

For normalized gauge-invariant ψ define

$$\mathcal{E}_L(\psi) = \frac{1}{|\ell|} \sum_{\ell} \|E_\ell \psi\|^2.$$

Define local fluctuation functional

$$\mathcal{F}_L(\psi) = \frac{1}{|x|} \sum_{x} \mathrm{Var}_{B_R(x)}(\psi).$$

Target Inequality

We seek a constant K independent of L such that

$$\mathcal{F}_L(\psi) \leq K \mathcal{E}_L(\psi) \quad \forall \psi \perp \Omega_L.$$

If true, uniform spectral gap follows.

Status: new rigidity invariant formulation.