Relative Magnetic Helicity Based on a Periodic Potential Field

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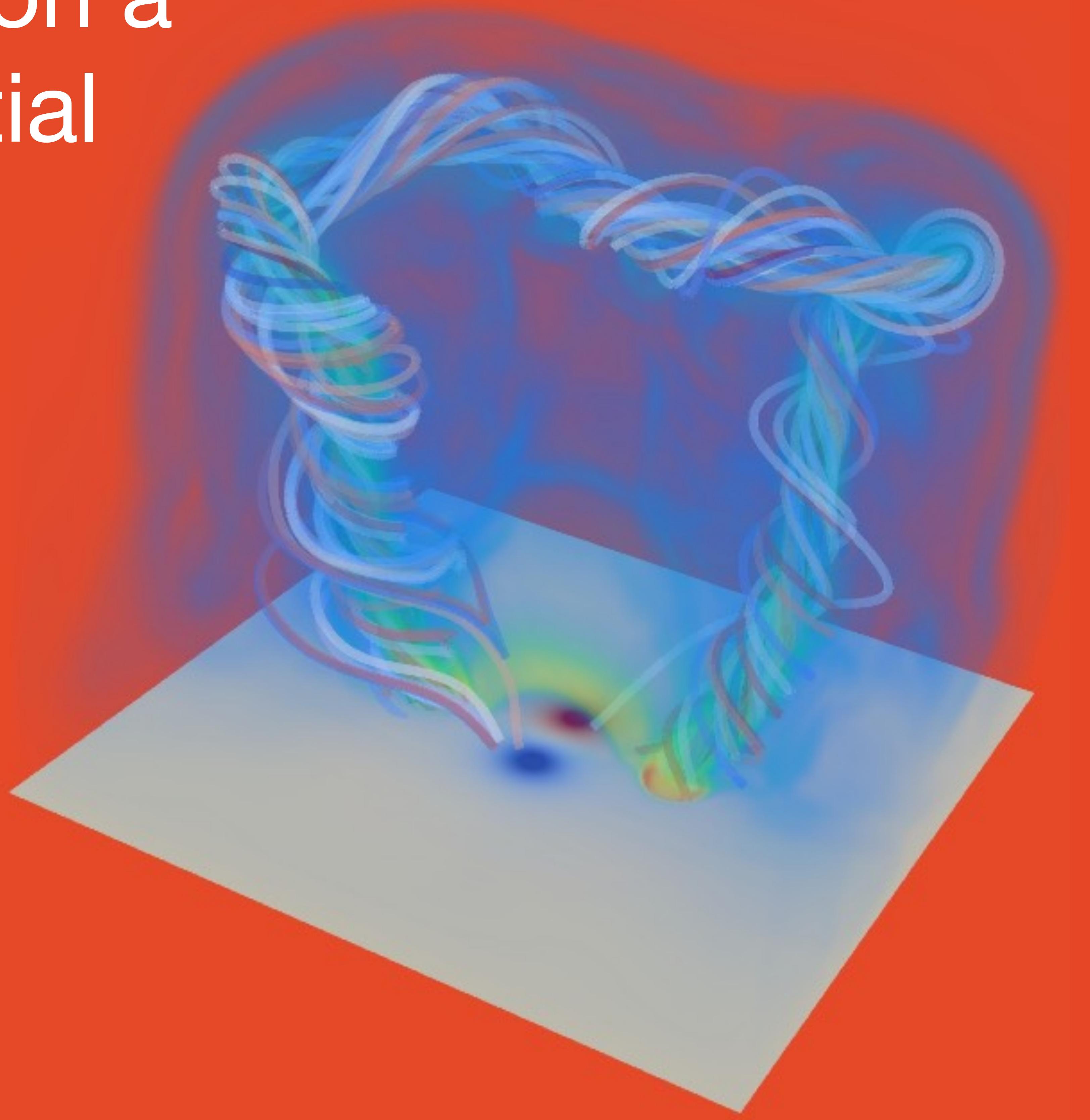


Magnetic Helicity

- Magnetic helicity is defined as

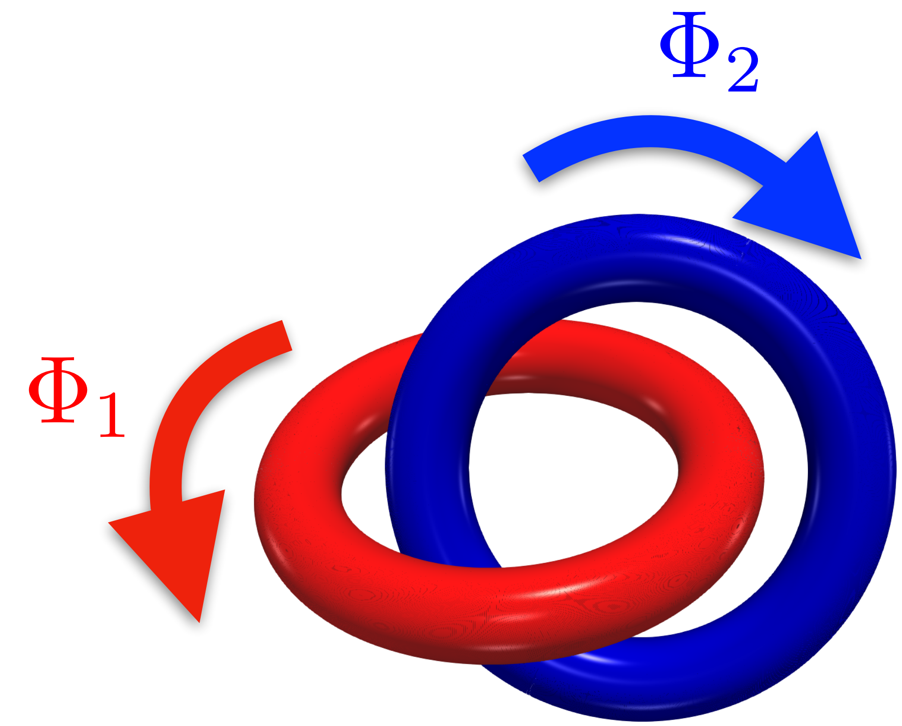
$$H = \int_{\Omega} \mathbf{A} \cdot \mathbf{B} \mathrm{d}^3 \vec{x}$$

  - Coulomb gauge =>

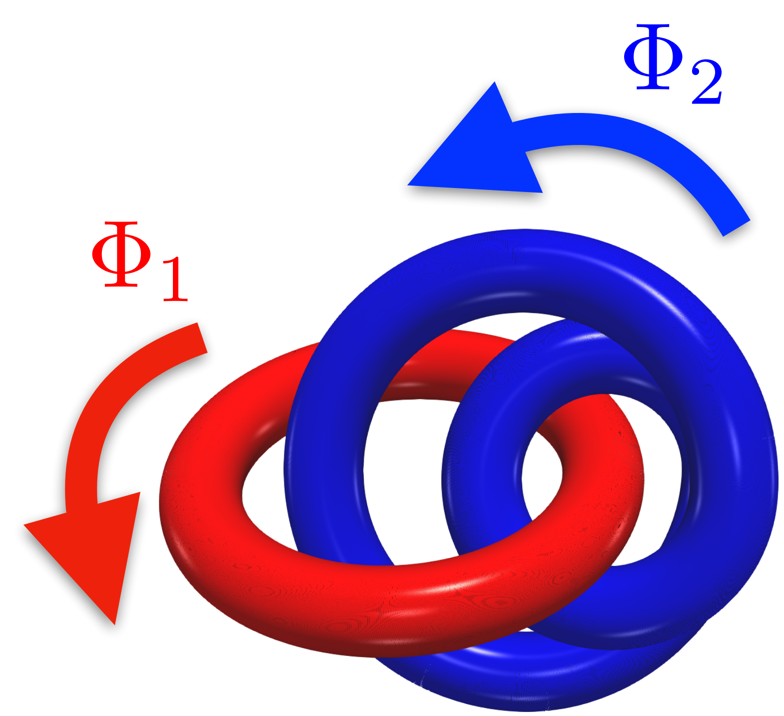
$$H = \int_{\mathcal{C}_1, \mathcal{C}_2} \mathcal{L}_{1,2} \mathrm{d}\Phi_1 \mathrm{d}\Phi_2$$

  - $\mathcal{L}_{1,2}$ is a topology invariant, which lead the helicity be a topology invariant.

- Quasi-/invariant under resistive/idea MHD process (Taylor 1986, Berger 1992).



$$H = 2\Phi_1\Phi_2$$



$$H = -4\Phi_1\Phi_2$$