Topology-Discrete vs Energy-Continuous Forces in Maxwell Tori

Abstract (<=120 words)

Topological charge is discrete, but the attractive force between two toroidal field lumps depends on their continuous energies. The shared field energy decays as the product of their energies divided by distance, leading—when differentiated—to an inverse-square force. Topology sets the interaction mode; energy determines its strength.

Skeleton

1. **Set-up** – two well-separated tori ($R, r \ll r_{\text{sep}}$); define energies U_1, U_2 and charges $Q^{(1)}, Q^{(2)}$.
2. **Mode analysis** – overlap integral of standing waves; show $W(r) = k(Q^{(1)}, Q^{(2)})\, U_1 U_2 / r$.
3. **Force derivation** – $F = -\partial_r W = -k\, U_1 U_2 / r^2$.
4. **Key distinction**
   - Topology: integers, fixed by continuity, cannot vary smoothly.
   - Energy: real positive, tunable by amplitude; determines F.
5. **Parameter-exchange examples** – *Many holes + low amplitude = few holes + high amplitude* gives equal force; table of cases.
6. **Numerical check** – finite-difference simulation confirming $F \propto -1/r^2$ for various (Q, A) pairs (brief plot).
7. **Experimental handle** – vary amplitude with fixed Q; predict measurable shift in fringe experiment.
8. **Conclusion** – topology sets identity; energy sets interaction; no conflict between discreteness of Q and continuity of forces.

Notes

- Keep "light-based metric" as a practical ruler only; emphasise metric-free statements of observables.
- Cite prior "energy–energy attraction" derivation and clearly state when that argument is reused.
- Append detailed proofs or numerical code; main text stays lean, ~6–8 pages each.

These outlines isolate the two messages you want: **(I) charge quantisation from topology, (II) inverse-square attraction from energy**, making the conceptual difference unmistakable.

chatgpt convo

https://chatgpt.com/c/6892797a-7af0-8330-aeb1-2f1757fa704b