

A microscopic description of the Witten effect with negatively massive fermions

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Inside topological insulators or in the $\theta=\pi$ vacuum, magnetic monopoles gain fractional electric charges, which is known as the Witten effect. In this work, we try to give a microscopic description for this phenomenon, solving a “negatively” massive Dirac equation. The “Wilson term” plays a key role in 1) identifying the sign of the fermion mass, 2) confirming evidence for dynamical domain-wall creations, and 3) understanding why the electric charge is fractional.

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