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## Axions, topology and electromagnetic fields on Lattice QCD

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The QCD vacuum is known to have a rich structure with non-trivial topologies. These can be classified with the topological charge, whose second moment can be shown to be related to the mass of the axion. It is also of interest the introduction of non-perpendicular electric and magnetic fields in QCD, which enhances the weight of non-zero topological sectors. For weak electromagnetic fields the topological charge becomes proportional to  $\vec{E} \cdot \vec{B}$  and the proportionality factor is the QCD contribution to the axion-photon coupling. We use Lattice QCD simulations with improved staggered quarks and background electromagnetic fields to compute at finite lattice spacing the QCD contribution to the axion-photon coupling, as well as the dependence of the axion mass with temperature and the magnetic field.

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