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QCD topology, axions and electromagnetic fields

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We present the first non-perturbative determination of the magnetic field dependence of the QCD topological susceptibility for temperatures in the crossover region. We use 2+1 flavours of improved staggered quarks at the physical point. In our study we employ a reweighting of the fermion determinant to reduce the discretisation effects and obtain a controlled continuum limit. The identification of the topological modes at low temperatures, necessary for the correct implementation of the reweighting, is complicated due to the mixing of the topological would-be zero modes and the modes building up the chiral condensate. We will show that the ratios of reweighted susceptibilities are unaffected to the possible misidentification of the topological zero modes. Furthermore we will also discuss our recent progress regarding the non-perturbative determination of the QCD contributions to the axion-photon coupling.

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