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## Improved bounds on the hot QCD axion

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The QCD axion is the most robust explanation to the strong CP problem and provides a good dark matter candidate. A population of QCD axions can be produced in the early universe via scattering with SM particles, and can be searched for in cosmological datasets. I will present the state-of-the-art bound on the minimal QCD axion model by confronting momentum-dependent Boltzmann equations, from axion-pion scattering below the QCD cross-over, against up-to-date measurements of the CMB and abundances from BBN. Finally, I will present forecasts using dedicated likelihoods for future cosmological surveys and a new sphaleron rate from unquenched lattice QCD.

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