

Observable windows for the QCD axion as a hot relic

I will discuss the possibility of detecting the QCD axion as a hot relic from the early universe, if it is directly coupled to quarks, such as in DFSZ models. For sufficiently low decay constant the dominant production mechanism at temperatures $1\text{GeV} \lesssim T \lesssim 100\text{GeV}$ is obtained via scatterings with heavy quarks. This leads to a contribution to the effective neutrino number, N_{eff} , which is larger than the one obtained when thermalization happens only above the electroweak phase transition, $\Delta N_{eff} \gtrsim 0.027$. Such a prediction is within reach of future CMB S4 experiments, thus opening an alternative window to detect the QCD axion and to test the early universe at such temperatures.

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