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# Reionization in the axiverse and the preference for low temperature reheating

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Axions that couple to electromagnetism are produced in the early Universe by,among other channels, freeze-in of the Primakoff process. The same interaction causes theaxions to decay to two photons, which subsequently ionize the intergalactic medium. If this decay occurs in the range of redshifts 20 ⪅ z ⪅ 1100 then the contribution to the cosmic
microwave background optical depth τ can lead to a conflict with observations, and excludes models with sufficiently strongly coupled, heavy axions and high reheating temperatures, Treh. Using ensembles of explicit type IIB string theory models with 50, 100 and 491 axions
we compute the full reionization history caused by axion decay. We compare this to the posterior on the high-z component of τ derived from model-independent constraints on the high-z ionization state of the Universe in a full Planck analysis presented in a companion paper. We find that 50% of the models in the ensemble prefer Treh ⪆ 10^11 (10^13) GeV at 68 (95)% C.L.. Our analysis opens the door for future large scale work studying the preference for low temperature reheating in models with multiple axions.

## Collaboration you are representing

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