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An open window for high reheating temperatures in supersymmetry

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Supersymmetric scenarios where the lightest superparticle (LSP) is the gravitino are an attractive alternative to the widely studied case of a neutralino LSP. A strong motivation for a gravitino LSP arises from the possibility of allowing higher reheating temperatures which are required by thermal leptogenesis and can be considered more likely in the light of the recently reported BICEP2 data. The predictions for the primordial abundances of light elements in the presence of a late decaying next-to-LSP (NSLP) as well as the currently measured dark matter abundance allow us to probe the cosmological viability of such a scenario. Here we consider a gravitino-stau scenario. Utilizing a pMSSM scan we work out the implications of the 7 and 8 TeV LHC results as well as other experimental and theoretical constraints on the highest reheating temperatures that are cosmologically allowed. Our analysis shows that points with $T_R > 10^9$ GeV survive only in a very particular corner of the SUSY parameter space. Those spectra feature a distinct signature at colliders that can be tested in the upcoming LHC run.

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