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Thermal goldstino production at low reheating temperatures

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I will discuss thermal production of (pseudo-)goldstinos, the Goldstone fermions emerging from (multiple-) SUSY breaking, when the reheating temperature is well below the superpartner masses. In such a case, the production during the early matter-dominated era is more important than after reheating. Depending on the SUSY breaking scale, goldstinos are produced by freeze-in or freeze-out mechanism via $1 \leftrightarrow 2$ decays and inverse decays. Goldstinos can maintain chemical equilibrium far after they are kinetically decoupled from the thermal bath, and consequently goldstinos with different momentum decouple at different temperatures. As a result their momentum distribution function shows a peculiar shape and the final yield is smaller than if kinetic equilibrium was assumed. I will revisit the cosmological implications in both R-parity-conserving and R-parity-violating supersymmetric scenarios. For the former, thermally produced goldstinos can still be abundant enough to be dark matter at present times even if the reheating temperature is low, of order 1 GeV. For the latter, if the reheating temperature is low, of order 0.1–1 GeV, they are safe from the BBN constraints.

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