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Enhancement of the dark matter abundance before reheating: thermal and non-thermal production

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In the first stages of inflationary reheating, the temperature of the radiation produced by inflaton decays is higher than the commonly defined reheating temperature T_R. At these temperatures particle production can be significantly enhanced. Furthermore, in the earliest stages of reheating, before thermalization takes place, scattering of the inflaton decay products with momenta comparable to the inflaton mass can further enhance the particle production rate relative to the thermal one.

I will discuss these effects in a high scale supersymmetry model in which the only supersymmetric state below the inflationary scale is the gravitino, which plays the role of the dark matter particle. In such scenario, the thermal and non-thermal enhancement dominates over the dilution by the later generation of entropy near T_R, leading to a relic abundance that is sensitive to the maximum temperature of the Universe, set by the time scale of thermalization.

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