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Production and Backreaction of Fermions from Axion- $U(1)$ Gauge Fields during Inflation

$U(1)$ gauge fields and axions can have a stable, isotropic and homogeneous configuration during inflation. However, couplings to other matter species lead to particle production, which in turn induces backreaction on background and can lead to destabilisation of the non-abelian and axion background.

In this talk, I first discuss the particle production by a $U(1)$ gauge field coupled to a massive Dirac doublet. In arXiv:1905.09258 we show that, calculating the particle production requires the following two improvements compared to what has been done in the literature.

1. Anti-symmetrisation of the operators.
2. Instantaneous subtraction to deal with the UV divergences.

We conclude that the backreaction of produced fermions on the $U(1)$ background is negligible for model parameters of observational interest.

I will also discuss production and backreaction of fermions due to coupling to the axion.

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