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Axion emission from strange matter in core-collapse SNe

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Axion emission is known to be strongly constrained by neutrino-burst data from SN 1987A. Compton-like nucleon-pion to nucleon-axion scattering has recently been shown to be an important mechanism, due also to the large baryon densities involved. We perform a first quantitative study of the role of hadronic matter beyond the first generation – in particular strange matter. We consistently include the full baryon and meson octets in axion emission from Compton-like scattering and from baryon decay. We consider a range of supernova thermodynamic conditions as well as various motivated scenarios for the axion-quark couplings. Irrespective of either modelling aspect, we find that axion emissivity introduces non-trivial correlations between flavour-diagonal axial couplings and constrains the off-diagonal, flavor-violating counterpart. This constraint can be as small as $O(10^{-2})$ for the QCD axion, i.e. for $f_a = 10^9$ GeV.

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