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Spontaneous Leptogenesis with sub-GeV Axion Like Particles ($17'+3'$)

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A derivative coupling of an axion-like particle (ALP) with a B-L current can lead to the baryon asymmetry of the universe through spontaneous leptogenesis, provided there is a lepton number-breaking interaction in thermal equilibrium. Typically, this requires heavy ALPs and a high reheating temperature, as the lepton number-breaking is also linked to neutrino mass generation. In this study, we propose leveraging an inert Higgs doublet to facilitate the lepton number-violating operator, reducing this constraint. This enables the generation of lepton asymmetry (via freeze-in/out processes) at a much lower reheating temperature, accommodating light (sub-GeV) ALPs that are sensitive to current and future ALP searches.

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