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The impact of flavour on scalar triplet leptogenesis

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Leptogenesis is an appealing framework to explain the baryon asymmetry of the universe. In its standard realization involving right-handed neutrinos, it has been shown that, if right-handed neutrinos are hierarchical, the flavour structure of Boltzmann equations describing the evolution of the lepton asymmetry simplifies a lot. When the charged lepton Yukawa are negligible, that is when the temperature of the universe is above 10^{12} GeV, the problem can be studied in the one-flavour approximation, whereas a full computation involving the 3 flavours is needed only below 10^9 GeV. In the intermediate regime where only the tau-Yukawa is non-negligible, a 2-flavour computation is sufficient.

On the other hand, we show that leptogenesis with a scalar triplet should always be studied in a fully flavoured framework. In particular, above 10^{12} GeV the correct treatment involves a 3×3 density matrix describing the lepton asymmetry in a flavour-covariant way, which generalizes the one-flavour approximation. We derived the Boltzmann equation satisfied by this matrix, and showed that flavour effects can affect the result significantly. As a consequence, the parameter space available for successful leptogenesis is enlarged.

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