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Falsifying Baryogenesis Mechanisms through Observation of Lepton Number and Flavor Violation

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The presence of $(B-L)$ violating interactions is a necessary ingredient in many models trying to explain the observed baryon asymmetry of the universe, but if they are found to be strong they herald the occurrence of a temperature range where any pre-existing $(B-L)$ asymmetry is washed out.

We demonstrate in a model-independent approach that the observation of lepton number violating processes can rule out or strongly disfavor certain mechanisms of baryogenesis, including leptogenesis scenarios. We will especially focus on non-standard mechanisms of neutrinoless double beta decay as well as potential lepton number violating processes at the LHC. If such processes are observed associated to a certain energy scale Λ_{LNV}, baryogenesis mechanisms acting at higher scales will be generally disfavored.

We will further describe how the argument can be strengthened by using information from lepton flavor violating processes such as $\mu \to e\gamma$. If additionally observed, it would indicate the presence of interactions that equilibrate different lepton flavors, closing the loophole of asymmetries being stored in different lepton flavors. We will outline in detail how baryogenesis mechanisms are affected by certain observations.

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