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# Neutrino masses and the origin of matter through leptogenesis

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During his presentation on "The Theory of Electrons and Positrons", Paul Dirac described how quantum mechanics and relativity made possible the prediction of the positron. After pointing out the apparent symmetry between positive and negative charge, he hinted that the universe could consist of equal amounts of matter and anti-matter but, for some unknown reason, human experience is confined almost entirely to matter. Notwithstanding, the symmetry between particles and antiparticles is firmly established in collider physics, which naturally poses the question of why the observed universe is composed nearly exclusively of matter, in contrast to little or no primordial antimatter. Despite its remarkable success in describing many of the inner workings of Nature at its most fundamental level, the Standard Model struggles to explain the existence of a biased Universe. A compelling possibility is that the baryon asymmetry of the Universe is generated dinamically, a scenario that is known as baryogenesis, which implies the non-conservation of the baryon number. In the past thirty to forty years, several mechanisms for baryogenesis have been put forth: GUT baryogenesis, electroweak baryogenesis, Affleck-Dine mechanism, spontaneous baryogenesis. Nonetheless, the most compelling one is the mechanism of baryogenesis via leptogenesis, first proposed by Fukugita and Yanagida, whose simplest and theoretically best motivated realization is within the seesaw mechanism of neutrino masses.

The objective of this work shall be to analyze the viability of leptogenesis, considering a model based on modular symmetries, by means of which we will determine the BAU and neutrino parameters, followed by a phenomenological analysis.

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