

Whispers from the Dark Universe - Particles & Fields in the Gravitational Wave Era

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WHISPERS FROM THE DARK UNIVERSE – PARTICLES & FIELDS IN THE GRAVITATIONAL WAVE ERA

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Naturally small neutrino mass with asymptotic safety and gravitational-wave signatures

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We revisit the dynamical generation of an arbitrarily small neutrino Yukawa coupling in the Standard Model with trans-Planckian asymptotic safety and apply the same mechanism to the gauged $B - L$ model. We show that thanks to the presence of additional irrelevant couplings, the described neutrino-mass generation in the $B - L$ model is potentially more in line with existing theoretical calculations in quantum gravity. Interestingly, the model can accommodate, in full naturalness and without extensions, the possibility of purely Dirac, pseudo-Dirac, and Majorana neutrinos with any see-saw scale. We investigate eventual distinctive signatures of these cases in the detection of gravitational waves from first-order phase transitions. We find that, while it is easy to produce a signal observable in new-generation interferometers, its discriminating features are washed out by the strong dependence of the gravitational-wave spectrum on the relevant parameters of the scalar potential

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