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About generating small Yukawa couplings naturally from trans-Planckian asymptotic safety

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[Based on JHEP 08 (2022) 262 (arXiv:2204.00866 [hep-ph]) by Kamila Kowalska, Soumita Pramanick, and Enrico Maria Sessolo]

It was shown that arbitrarily small Yukawa couplings could be generated naturally for gauge-Yukawa systems in trans-Planckian asymptotic safety framework due to the presence of a non-interactive infrared-attractive fixed point.

Apart from the non-interactive infrared-attractive fixed point, more ultraviolet-attractive fixed points are also present ensuring well-defined nature of the theory at infinitely high scale.

This technology was used for a system of Yukawa couplings of the Standard Model extended by three right-handed neutrinos and

asymptotically safe solutions for Dirac neutrinos satisfying the experimental constraints on neutrino masses and mixing could be achieved

for Normal Ordering. This general mechanism can also yield the feeble Yukawa interactions needed for correct relic density via freeze-in for sterile-neutrino dark matter models.

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