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Yukawa couplings from magnetized tori

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One of the current problems of the Standard Model is that it does not predict the parameters of the flavor sector, e.g. mixing angles and CP phases need to be adjusted by hand. Recently, a new approach to address this problem has been to assume that Yukawa couplings are modular forms which give rise to a modular flavor symmetry in the Lagrangian. The two main ways to proceed have been to either impose the modular symmetry, or to derive it from e.g. a compactified torus. In this work, using the latter approach, we obtain a simplified version of Yukawa couplings, which are given by the overlap integral of the Dirac zero-mode wavefunctions. Using Euler's Theorem, we derive closed form analytic expressions for these Yukawa couplings that are valid for arbitrary magnetic flux parameters. This form is not only simple, but also has the advantage of making the modular transformations of Yukawa coupling more transparent.

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Primary author: Ms SHUKLA, Shreya

Presenter: Ms SHUKLA, Shreya

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