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Emergent Symmetry in a Two-Higgs-Doublet Model from Quantum Magic

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There is growing interest in the application of quantum information theory concepts to particle physics model-building. Recent research has established that the extremization of entanglement in particle scattering provides a natural way to realise interesting theoretical structure, both within and without the Standard Model. The success of these entanglement studies begs the question: can other information-theoretic measures be used in a similar manner? In this talk, I will present the results of our recent investigation into this question (arXiv:2506.01314), focusing on the application of “magic”—a concept originating in quantum computation—to a two-Higgs-doublet model. I will motivate the concept of magic, describe how magic conservation in a particular 2-to-2 scalar scattering channel reproduces Standard Model alignment, and outline how the formalism may be generalised to accommodate a broader class of processes in our two-Higgs-doublet framework.

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