## Phenomenology 2022 Symposium: From Virtual to Real



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## Systematics of U-spin Amplitude Sum Rules

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The main challenge in probing weak interactions comes from non-perturbative QCD effects. In our work we use U-spin symmetry, an approximate SU(2) symmetry of the QCD Lagrangian under unitary rotation of down and strange quarks, to derive algebraic relations between decay amplitudes when exact calculations are not possible. Such relations between amplitudes are called U-spin sum rules. We systematically study U-spin sum rules and find a rich mathematical structure that underlines them. We prove several general properties and show the universality of sum rules. The understanding that we gain from our analysis allows us to derive sum rules to any order of symmetry breaking without explicitly calculating the Clebsch-Gordan coefficient tables as is done in the standard approach to U-spin sum rules. We do this via constructing a multi-dimensional lattice where each node represents an amplitude. The sum rules are read off the lattice. The multidimensional lattice is reduced to a simple diagrammatic approach for many practical cases that we consider. We provide several examples that demonstrate how to apply our general results to systems that can be probed experimentally.

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