

Discovering Light Scalars Beyond Minimal Flavor Violation

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We study a simple class of flavored scalar models, in which the couplings of a new light scalar to standard-model fermions are controlled by the flavor symmetry responsible for fermion masses and mixings. The scalar couplings are then aligned with the Yukawa matrices, with small but nonzero flavor-violating entries. D-meson decays are an important source of scalar production in these models, in contrast to models assuming minimal flavor violation, in which B and K decays dominate. We show that FASER2 can probe large portions of the parameter space of the models, with comparable numbers of scalars from B and D decays in some regions. If discovered, these particles will not only provide evidence of new physics, but they may also shed new light on the standard model flavor puzzle.

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