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Light Scalars at FASER

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FASER, the ForwArd Search ExpeRiment, is a currently operating experiment at the Large Hadron Collider (LHC) that can detect light long-lived particles produced in the forward region of the LHC interacting point. In this paper, we study the prospect of detecting light CP-even and CP-odd scalars at FASER and FASER 2. Considering a model-independent framework describing the most general interactions between a CP-even or CP-odd scalar and SM particles using the notation of coupling modifiers in the effective Lagrangian, we develop the general formalism for the scalar production and decay. We then analyze the FASER and FASER 2 reaches of light scalars in the large tan beta region of the Type-I two Higgs double model as a case study, in which light scalars with relatively long lifetime could be accommodated. Both FASER and FASER 2 can probe a large part of the parameter space in the large tan beta region up to 10ˆ7, extending beyond the constraints of the other existing experiments.

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