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Multi-scalar signature of self-interacting dark matter in the NMSSM and beyond

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We implement the self-interacting dark matter scenario in the NMSSM and beyond. An improved analytical estimation for the dark matter (DM) self-interacting cross section is proposed. Due to the large couplings and light mediator in SIDM scenario, the DM/mediator will go through multiple branchings if they are produced with high energy. Based on the Monte Carlo simulation of the showers in DM sector, we obtain the multiplicities and the spectra of the DM/mediator from the Higgsino production and decay at the LHC for our benchmark points.

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