

Dark photon pair production via off-shell dark Higgs at FASER

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We consider a dark photon model in which the dark $U(1)$ gauge symmetry is spontaneously broken by a vacuum expectation value of a new scalar boson. We focus on the ForwArd Search ExpeRiment (FASER) and calculate its sensitivity to the dark photon produced from the off-shell decay of the new scalar boson. It is found that the off-shell production extends the sensitivity region beyond the kinematical threshold of the on-shell decay of the scalar boson, and that the sensitivity region can be spanned to unexplored region. We also show the parameter space in which perturbative calculation is valid for the unitarity of an S matrix.

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