

Snowmass2021 - Letter of Interest

Dark Matter via Higgs portal at CEPC

Thematic Areas: (check all that apply /■)

- (EF01) EW Physics: Higgs Boson properties and couplings
- (EF02) EW Physics: Higgs Boson as a portal to new physics
- (EF03) EW Physics: Heavy flavor and top quark physics
- (EF04) EW Precision Physics and constraining new physics
- (EF05) QCD and strong interactions: Precision QCD
- (EF06) QCD and strong interactions: Hadronic structure and forward QCD
- (EF07) QCD and strong interactions: Heavy Ions
- (EF08) BSM: Model specific explorations
- (EF09) BSM: More general explorations
- (EF10) BSM: Dark Matter at colliders
- (Other) [*Please specify frontier/topical group*]

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The branching ratio of Higgs invisible decay into the dark matter can be probed up to less than 0.3% at the CEPC with $5.6 ab^{-1}$. This will set strong constraints on the dark matter models with Higgs portal for dark matter mass smaller than half of the Higgs mass (62.5 GeV). We will perform the model independent study of dark matter particles in the context of a real scalar, a complex scalar, a chiral fermion, or a Dirac fermion. We will also discuss the maximal couplings between dark matter particles and Higgs field from the Higgs invisible decay branching ratio. Then we will calculate the dark matter annihilation cross section, as well as the dark matter relic density. In addition, we shall study the dark matter direct and indirect experimental searches.