



中国科学院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

CEPC BSM Intro

– towards white paper



Oct. 26, 2023

Introduction

Timeline and todo described detail at [here](#)

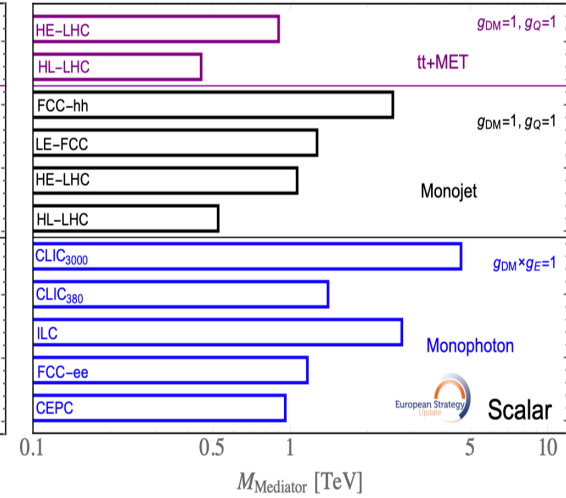
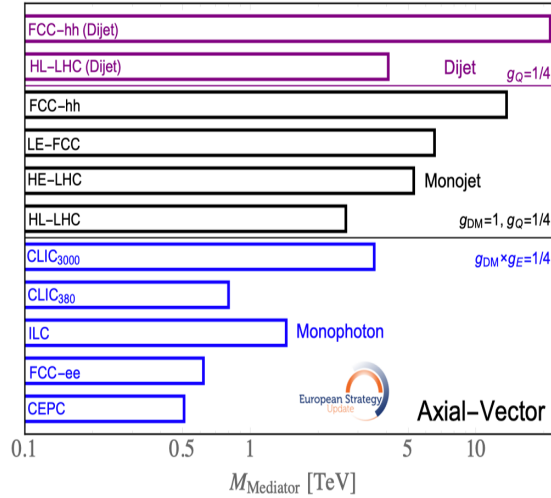
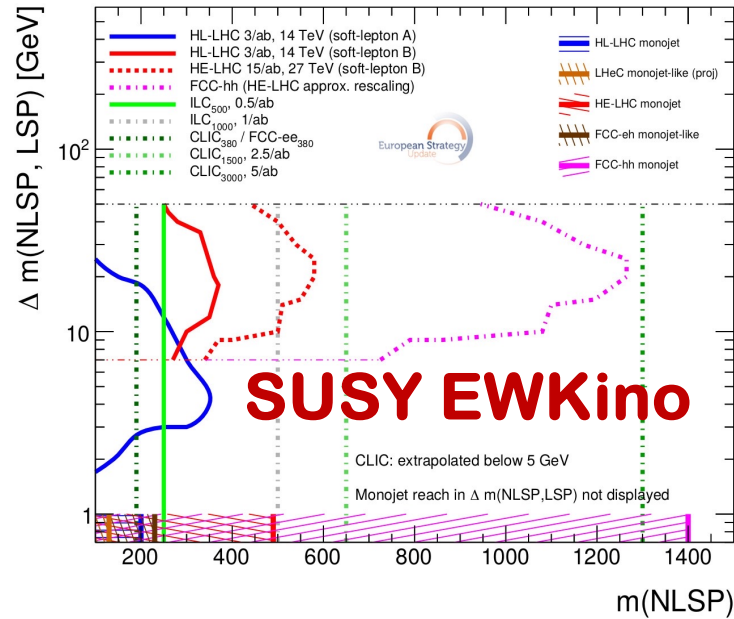
- BSM Inputs collection (by end of Sep. 2023)
 - Can still collect if we have additional contributions ([more info](#))
- **Session Content editing (Oct.1 –Nov.31 2023)**
 - <https://www.overleaf.com/project/652f76a43f5ffbb1336f3e8b>
 - Contact Jia Liu if you have issues to edit
 - Refer examples at <https://arxiv.org/abs/2205.08553>
 - Any summary plots from each session?
- Integration of Session Content (Dec. 1 – 31, 2023)
 - Authors to be collected in parallel
- Authors review and revise the initial draft (Jan. 1 - 31, 2024)
- Informal meeting bi-weekly? Like Thursday 10am? (TBD)

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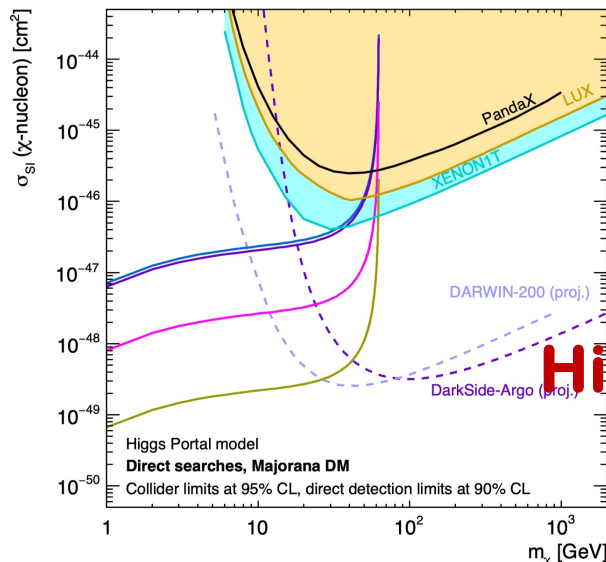
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Examples of summary plots from Eur. Strategy

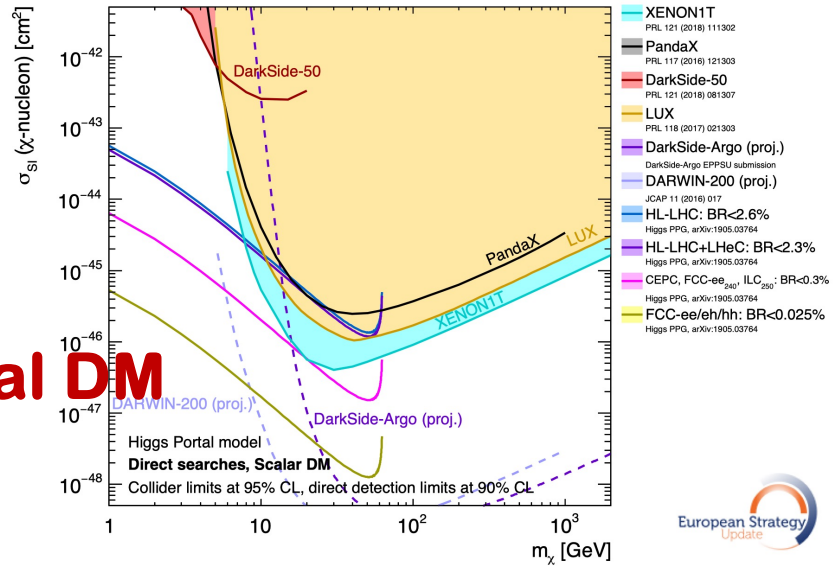
Higgsino-like EWK processes



SUSY DM

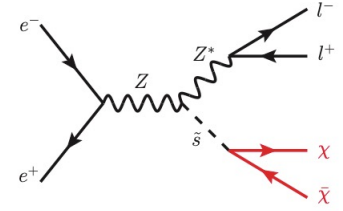
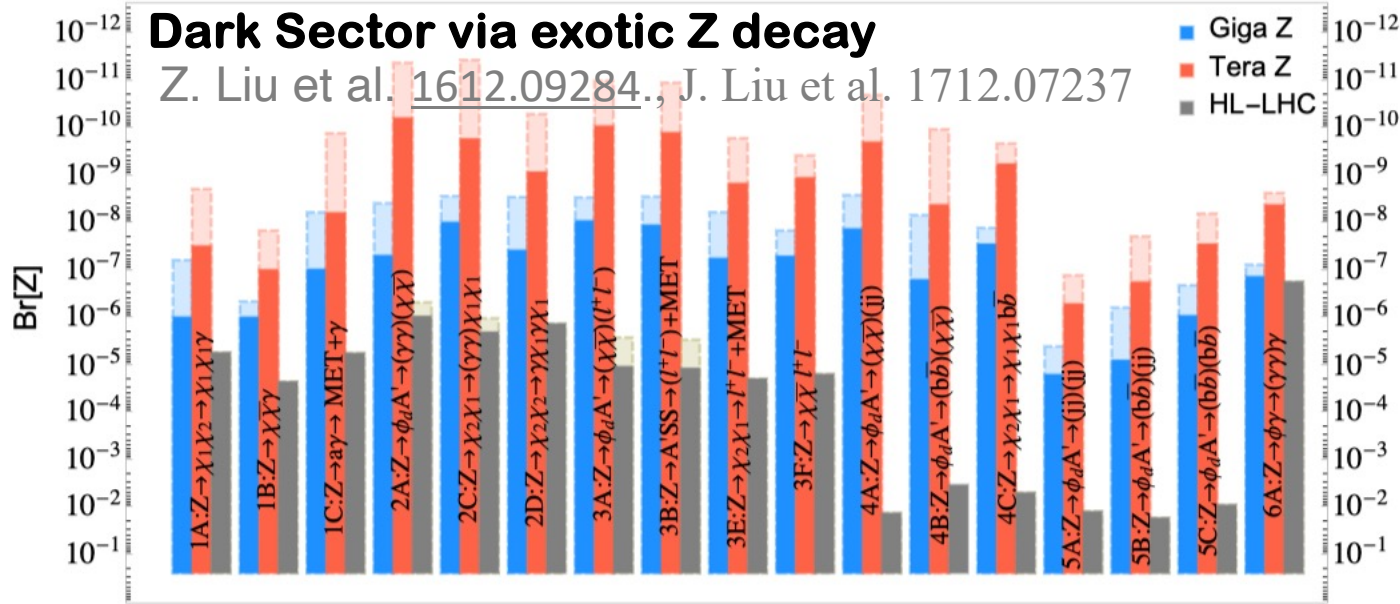


Higgs-portal DM

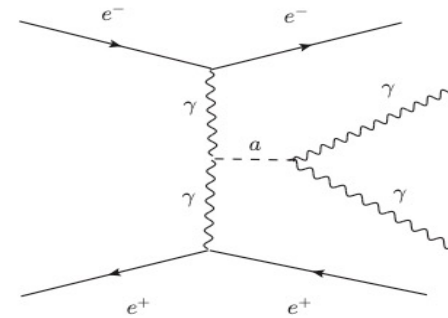
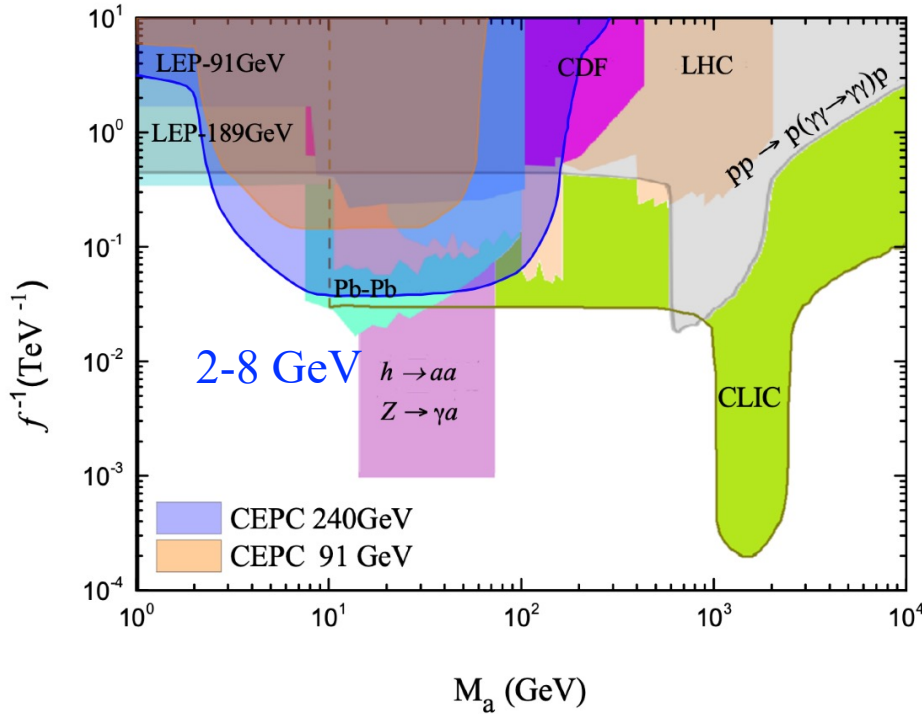


Dark Sector via exotic Z decay

Z. Liu et al. 1612.09284., J. Liu et al. 1712.07237

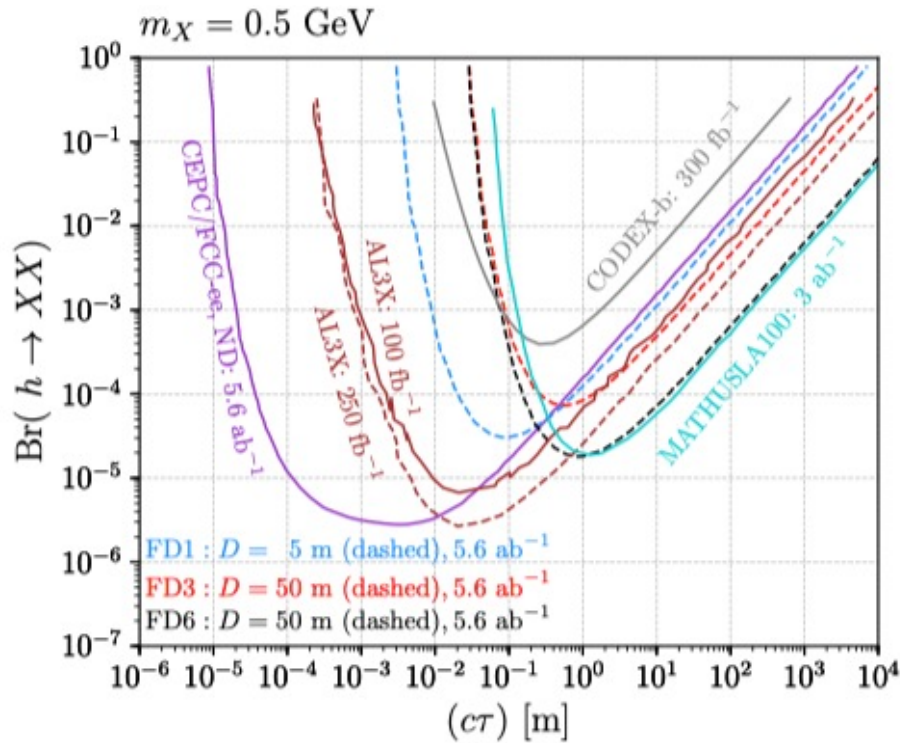
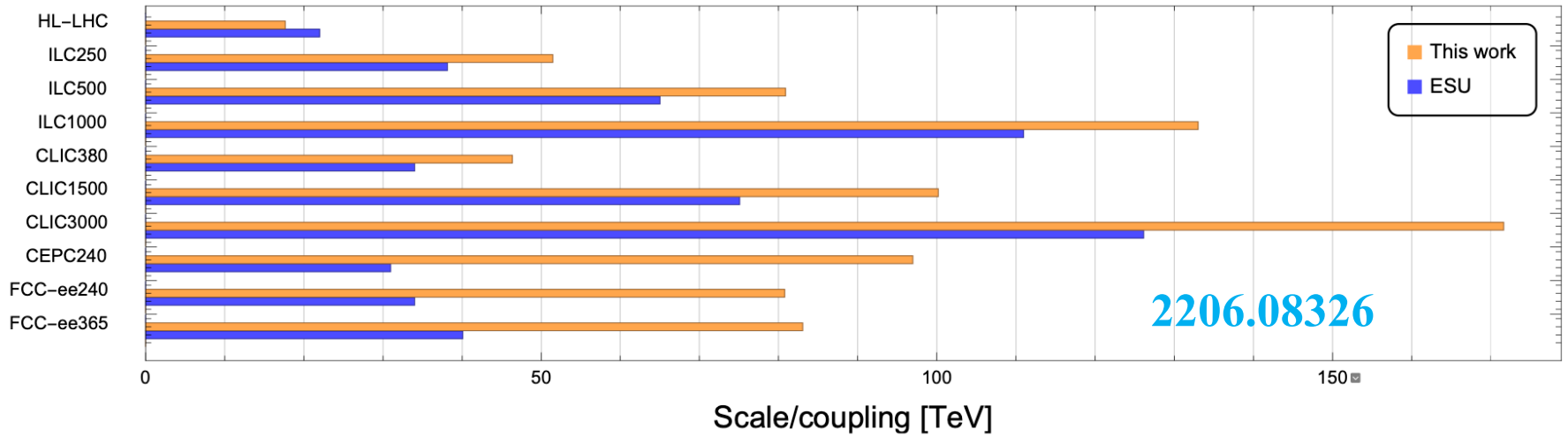


ZL, et al., 1903.12114



H.Y. Zhang. Eta., arXiv: 2103.05218

95% CL scale limits on 4-fermion contact interactions from O_{2B}



Light Scalars from Exotic Higgs Decays

1911.06576

CEPC BSM Physics Program

Exotics of Higgs, W, Z, top

- Exotic Higgs decay
- Exotic W/Z and top decay
- Light higgs
-

Indirect searches from SM precision measurements
(not included here)

Global fits

- Global fit of SUSY
- SMEFT global fit

SUSY

- Light EWKinos
- Light sleptons
- Heavy selectrons
- Axinos
-

Z/flavor factory
 $\sqrt{s} \sim m_Z, > 2m_W$
 $5 \cdot 10^{12}$ Z events
 Few 10^8 W events
 10^{12} bb/cc events
 $1.7 \cdot 10^{11}$ $\tau\tau$

CEPC

Top factory
 $\sqrt{s} = 340-365 \text{ GeV}$
 10^6 HZ events
 10^5 WW \rightarrow H events

BSM @ flavor

- Flavor violation
- Flavor anomalies
-

Higgs factory
 $\sqrt{s} = 240, 365 \text{ GeV}$
 10^6 HZ events
 10^5 WW \rightarrow H events

More exotics

- Heavy neutrinos
- Axion-like particles
- Identify CP-odd component in Higgs
-

Dark Matter & Dark Sector

- SUSY DM
- Higgs portal DM
- Vector boson portal DM
- Fermion portal DM
- EFT
-

EWPT & GW

Long-lived particles

- At both CEPC and it's FAR detector

BSM Inputs & Status

- Exotic Decays
 - Higgs exotic decay (1709.06103; [1612.09284](#), 1808.02037; 1912.01431; 2008.05492; 2011.04540)
 - Z/W/Top exotic decay
 - Light higgs ([Sven's talk](#))
- SUSY Searches
 - Direct SUSY Searches (CPC46(2022)013106; 2101.12131; 2203.10580; 2202.11011, 2211.08132)
 - Indirect search of SUSY (2010.09782)
- Dark Matter and Dark Sector searches
 - Lepton portal DM (JHEP 06 (2021) 149)
 - Asymmetric DM (PRD 104(2021)055008)
 - Dark Sector from exotic Z decay (1712.07237), Dark Sector-photon interactions (2208.08142)
 - DM (Millicharged DM, Vector portal DM, DM with EFT interactions): 1903.1211
 - Mono-gamma (2205.05560) ,
 - Dark Fermion in light of Electron Target Absorption ([Kai Ma's talk](#))
- Long-lived particles (1904.10661, 1911.06576, 2201.08960, Yulei Zhang's [Talk](#), Wei Su's [Talk](#), Cen Mo's [Talk](#);))
- More exotics:
 - Heavy neutrinos (2102.12826, 2201.05831);
 - Axion-like particles (2103.05218, 2204.04702, 2210.09335, [J. Phys. G](#))
 - Electroweak phase transition (1911.10210, 1911.10206, 2011.04540, 2204.05085)
 - Identify CP-odd component in Higgs (Changlong Xu's [talk](#))
- Global fits:
 - Global fit of SUSY (2203.04828, 2203.07883)
 - SMEFT global fit (2206.08326)