Snowmass Compressed Electroweak SUSY Kickoff

EF08: Compressed Electroweak SUSY – August 31, 2020

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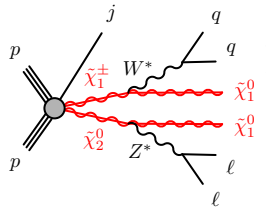
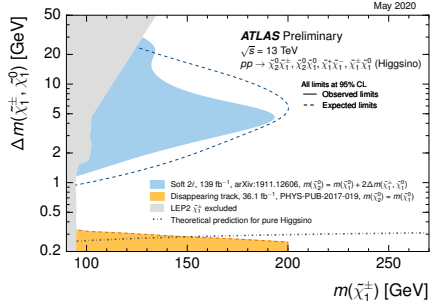
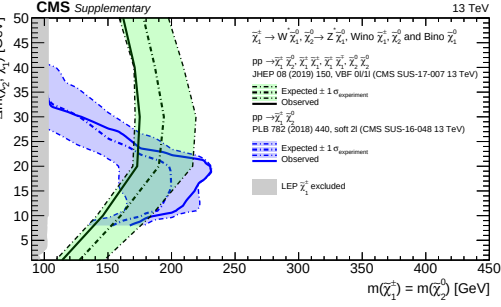
Introduction

Welcome!

- Compressed electroweakinos/sleptons remain highly motivated at the LHC and beyond
  - Naturalness, WIMP dark matter, muon $g-2$
  - But difficult: low cross-section, soft final-state objects
- Significant experimental progress over last few years (just surpassing ~ 20 y/o LEP limits!)
- Snowmass: build on existing program, develop new ideas, understand physics potential of various machines
- Goal: provide forum for focused discussion and collaboration on compressed EWK SUSY models



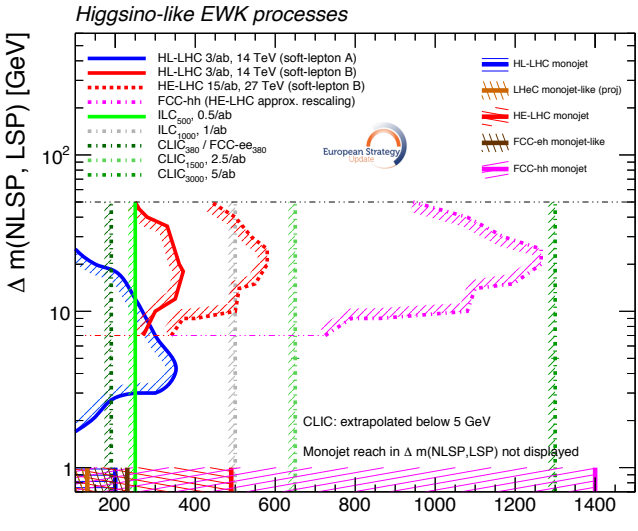




European Strategy: Higgsino Projections

European Strategy summary plot

- Need to assess the merits of this plot
- Monojet/disappearing track: pure higgsinos ($\Delta m \approx 350\,\text{MeV}$)
- HE-LHC/FCC-hh 2ℓ: simple σ and $\mathcal{L}$ rescaling, no reoptimization
- How can we improve existing projections?
- Where can we inject new ideas?



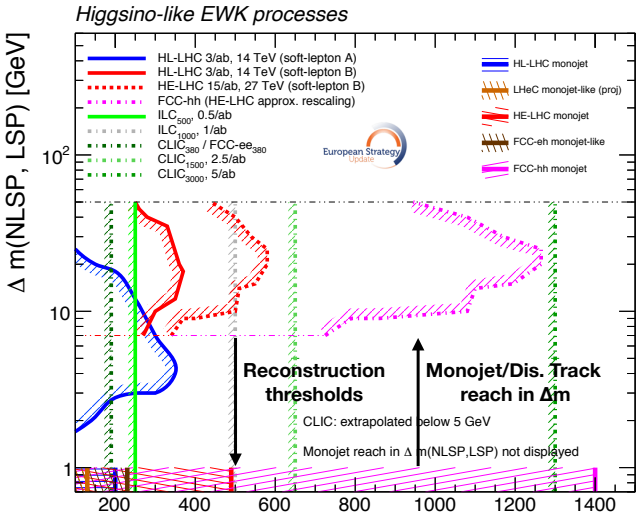
European Strategy: Higgsino Projections

Crucial program: closing the gaps

- No attempt to determine reach in Δm from monojet/disappearing track signatures
- Maintaining low lepton reconstruction thresholds for $\Delta m \approx 1 - 10\,\text{GeV}$

Inject new ideas

- Emerging LHC program of VBF production
- Novel track/soft lepton triggers
- 3ℓ final states
- ...



European Strategy: Higgsino Projections

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Inje

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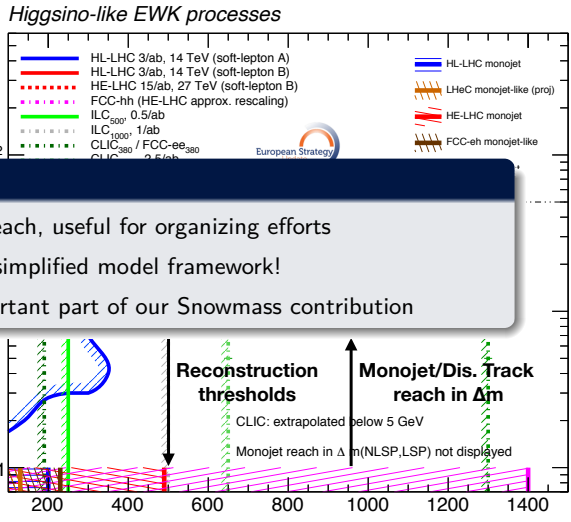
Beyond a "Summary Plot"

- Summary plots are just an example of collider reach, useful for organizing efforts
- But lots of interesting work to be done outside simplified model framework!
- Assessing realistic models will hopefully be important part of our Snowmass contribution



So What Now?

Near-term goals:

- Determine our background MC needs (time sensitive!)
  - Assess overlaps with EF09/EF10 (e.g. $Z(\rightarrow \nu\nu) + \text{jets}$)
  - Sufficient detector modeling for displaced/disappearing track signatures?
- Converge on benchmark signal models (electroweakinos, sleptons)
- Personpower: SEC Project Matching Survey

Longer-term goals:

- Provide robust projections of sensitivity to compressed EWK SUSY
- Fill in sensitivity gaps at hadron colliders
- Identify limitations at various colliders (trigger, lepton reco. thresholds, tracker layout, etc.)
- Articulate the importance of our physics case

The Snowmass Dream:
To provide your children with a better understanding of naturalness and dark matter than you had

Today's Agenda

9:00 AM → 9:10 AM **Introduction** 10m

Speakers: Jeff Shahinian (University of Pennsylvania (US)), Mike Hance (Lawrence Berkeley National Laboratory)

9:10 AM → 9:20 AM **Aspects of higgsino pair production signals at LHC** 10m

Speaker: Howard Baer (University of Oklahoma)

EF08-compressed-E...

9:20 AM → 9:30 AM **Electroweakino Investigations, Ideas towards more general EW sector searches/interpretation** 10m

Speaker: Graham Wilson (University of Kansas)

9:30 AM → 9:40 AM **Compressed EWK @ UC Santa Cruz** 10m

Speaker: Mike Hance (UC Santa Cruz)

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9:40 AM → 9:50 AM **Compressed EWK @ UPenn** 10m

Speaker: Shion Chen (University of PennSylvania)

9:50 AM → 10:20 AM **Discussion** 30m

Open discussion on considerations for compressed electroweak SUSY searches.

Backup