

EF08: Model Specific Explorations

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Outline

- Restarting and schedule
- MC simulation
- Thinking ahead about topical group report plots

Restarting

Restart of Snowmass Energy Frontier Officially July 1st

- Resumption of EF08 meetings: currently today (July 8th) and July 22nd, 22nd both from 12-1pm EDT.
- May add one in August but timing is difficult.
- Will probably survey for setting times for Sept +

Energy Frontier Restart Workshop

- <https://indico.fnal.gov/event/49756/>
- Aug 30th - Sept 3rd (virtual), 10:00 am-4:30 pm (US Eastern) with lunch and “coffee” break

EF08 Short term goals

- Identify progress made:
- **MC production needs (let's not wait until it's too late)**
- Consolidate our understanding of what people plan to provide and how it might fit in, identify gaps, etc.
- For all three of above please fill in form:
<https://forms.gle/qdgj5k35rqu9gusw9>

Snowmass Timeline

7/1/21 Restart of activities	7/12-14/21 DPF Meeting Snowmass Townhall	EF workshop Aug-Sep '21 + Additional workshops (Dec 21 - Mar 22)	3/15/22 Deadline Contribute d Papers	5/31/22 Preliminary TG Reports	6/30/22 Preliminary Frontier Reports	7/22 Community Summer Study (UW-Seattle)	9/30/22 Final Reports	10/31/22 Snowmass Book & online archive docs
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Upcoming events

- DPF July 12-14: Town Hall Meeting on July 14 on Snowmass updates
- Energy Frontier Restart Workshop, Aug 30th - Sept 3rd (virtual)
 - EF08 parallel session currently planned for Thursday 10am-12pm EDT
 - But of course the point of the workshop is to thinking across the sub-groups
- Expect a “status/progress” workshop in ~December
- Expect a TG report workshop late March (to assess what to include in the topical group report)

MC: my understanding

Energy Frontier MC group is active and is preparing a lot of resources for use by the topical groups

- But if we don't give them input it's our fault if we don't get what we need
- <https://snowmass21.org/montecarlo/energy> has getting started and info on plans
- Not everything is easy to find yet, so here is my understanding

MC strategy

- MC group will make large hadron collider bkg samples “proactively”
 - I.e. they will use past needs to build a list of likely requests (later slide) and make large samples
- MC group will make other collider samples “reactively”
 - Smaller CPU requirements means less planning needed
- Groups need make their own signal samples, but can use OSG resources see <https://snowmass21.org/montecarlo/energy> to generate and share
 - We might want to try to coordinate mode choices and samples in EF08 ... discuss?

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- <https://snowmass21.org/montecarlo/energy> has getting started and info on plans (see here also: https://indico.fnal.gov/event/44870/contributions/198448/attachments/136004/168905/Stupak_100720_SnowmassEFMCTF.pdf)
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Collider Configuration and Energies Planned

Circular colliders merged

- put all others left ~as is

Machine	Energy						
Circular ee	m_z	$2m_W$	240	$2m_t$			GeV
ILC	250	350	500	1000			
CLIC					1500	3000	
HL-LHC/FCC-hh	14	75	100	150			TeV
LHeC/FCC-eh	1.3	3.5					
$\mu\mu$	3	10	14	30			

Delphes cards for all configurations on EF MC page

- No full simulation (left up to collaborations)

Hadron Collider Background Samples Planned

Follows 2013 list

- <https://arxiv.org/pdf/1309.1057.pdf>
- There is a request form on the MC page if you need others

Dataset name	Physics process	Number of recoil jets
B-4p	γ or on-shell W, Z	0
Bj-4p	γ or on-shell W, Z	1-3
Bjj-vbf-4p	γ or off-shell W, Z, H in VBF topology	2-3
BB-4p	Diboson (γ, W, Z) processes	0-2
BBB-4p	Tri-boson (γ, W, Z) processes including BH	0-1
LL-4p	Non-resonant dileptons (including neutrinos) with $m_{ll} > 20$ GeV	0-2
LLB-4p	Non-resonant dileptons with an on-shell boson, $m_{ll} > 20$ GeV	0-1
H-4p	Higgs	0-3
tj-4p	Single top (s- and t-channel)	0-2
tB-4p	Single top associated with a boson	0-2
tt-4p	$t\bar{t}$ pair production	0-2
ttB-4p	$t\bar{t}$ associated with γ, W, Z, H	0-1

Table 1-2. Table of background processes. All processes include the particles in the dataset name plus additional recoil jets up to four generated particles. On-shell vector bosons, off-shell dileptons, Higgs bosons, top quarks, and jets are denoted $B, LL, H, t,$ and $j,$ respectively. In the $Bjj-vbf-4p$ case, B includes Higgs. In the $BBB-4p$ case, BBB includes BH . Samples are generated in bins of H_T^* for $\sqrt{s} = 14, 33,$ and 100 TeV.

MC Summary

Please look to see if what you needed is available

- Let us know either way in our form, we don't want groups getting stuck
- Technical questions on the EF08 slack channel are encouraged

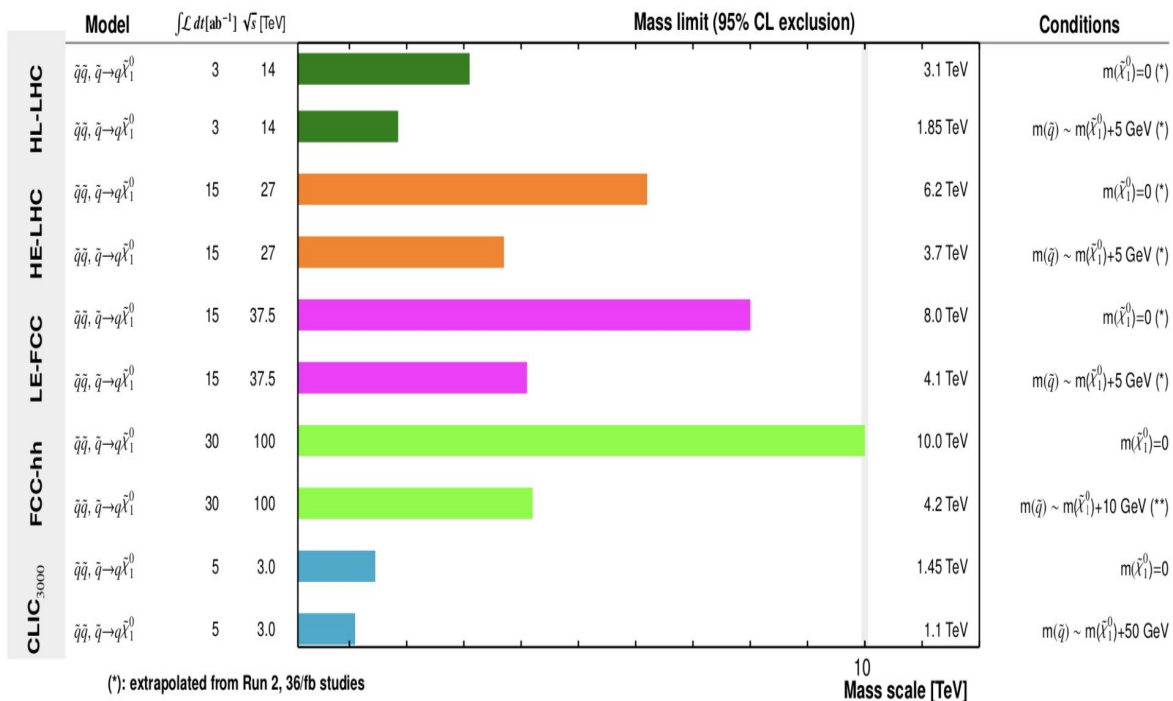
Plots we want... hadronic SUSY

What needs to change

- any issues with these? things that should be added/changed?
- add new hh collider energies
- add muon collider
- (how) do we input pMSSM

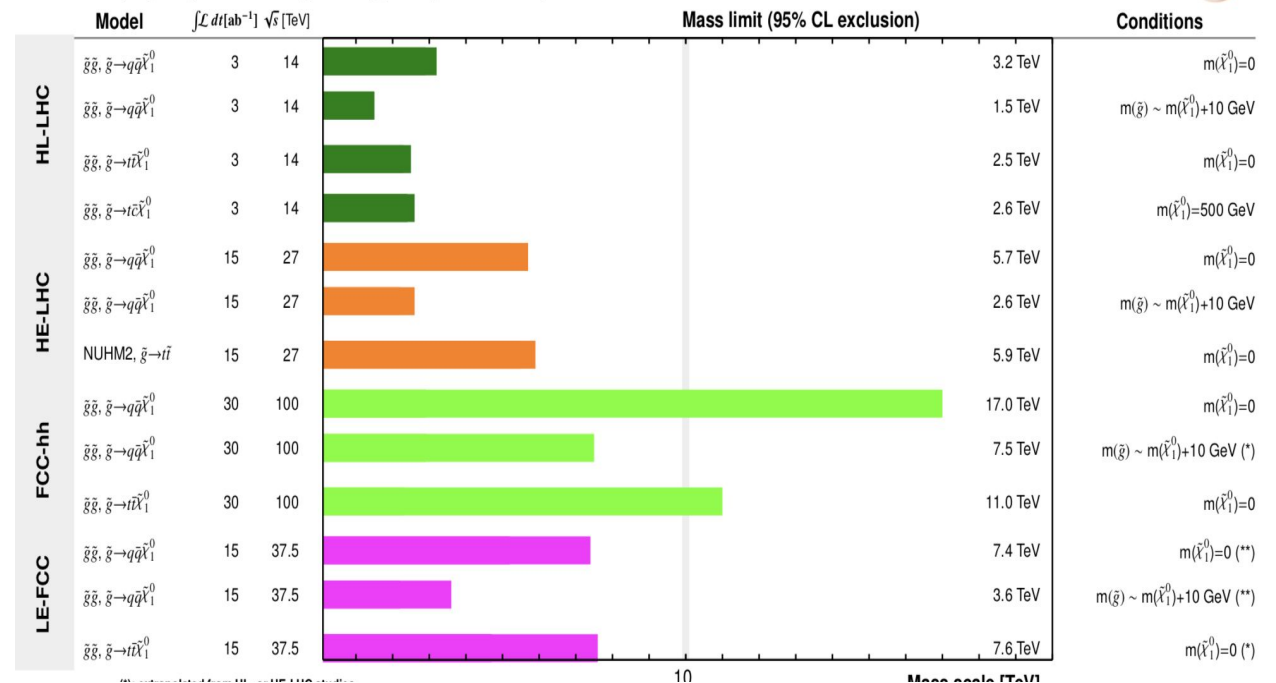
All Colliders: squark projections

(R-parity conserving SUSY, prompt searches)



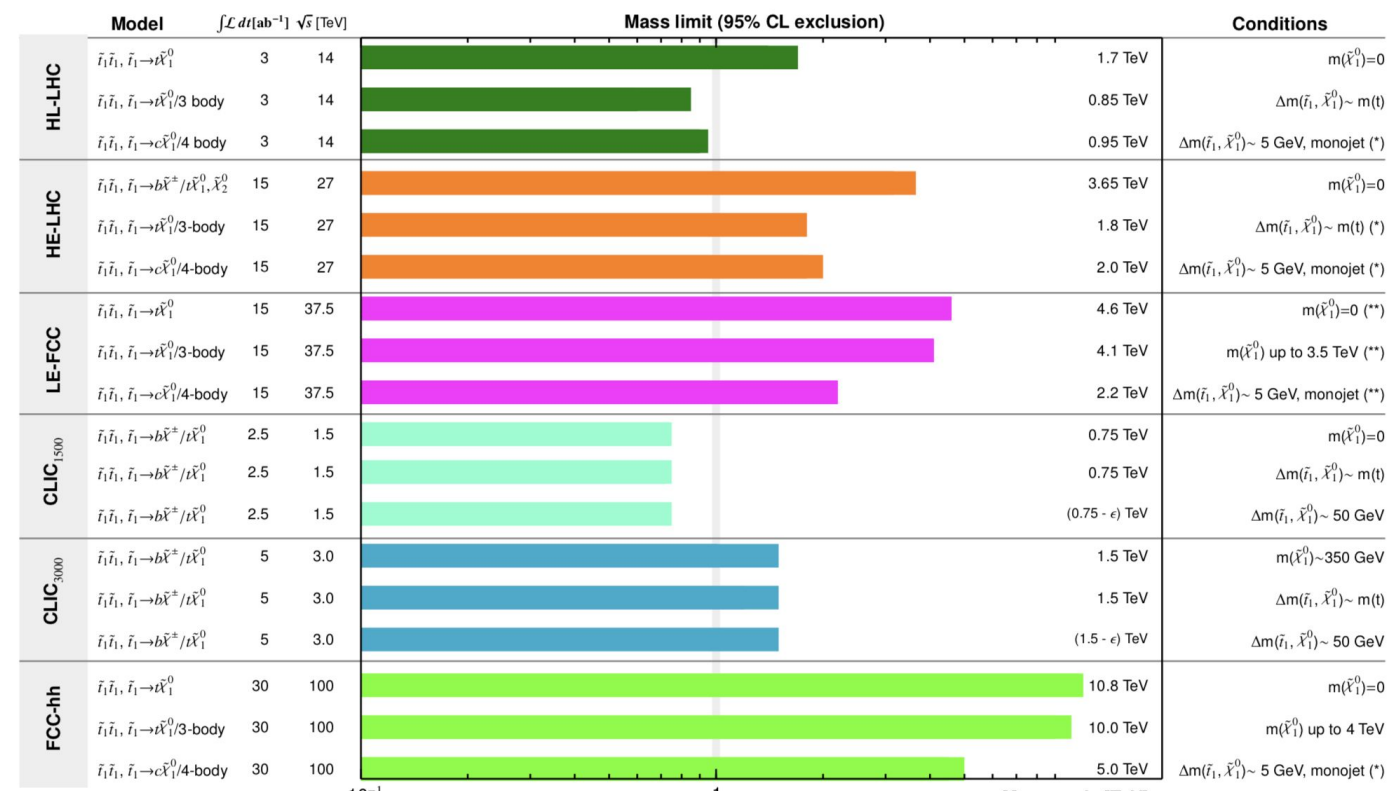
Hadron Colliders: gluino projections

(R-parity conserving SUSY, prompt searches)

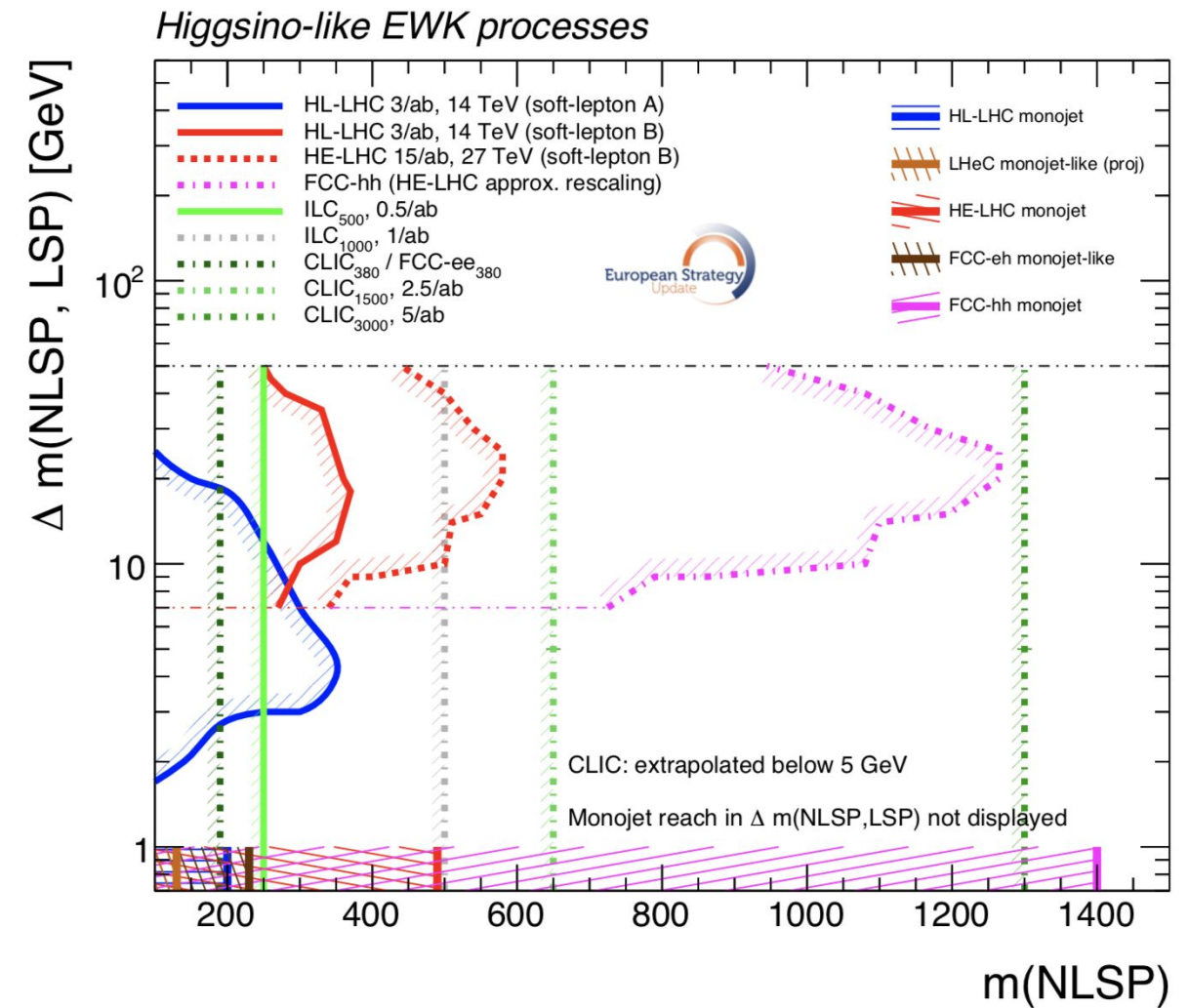
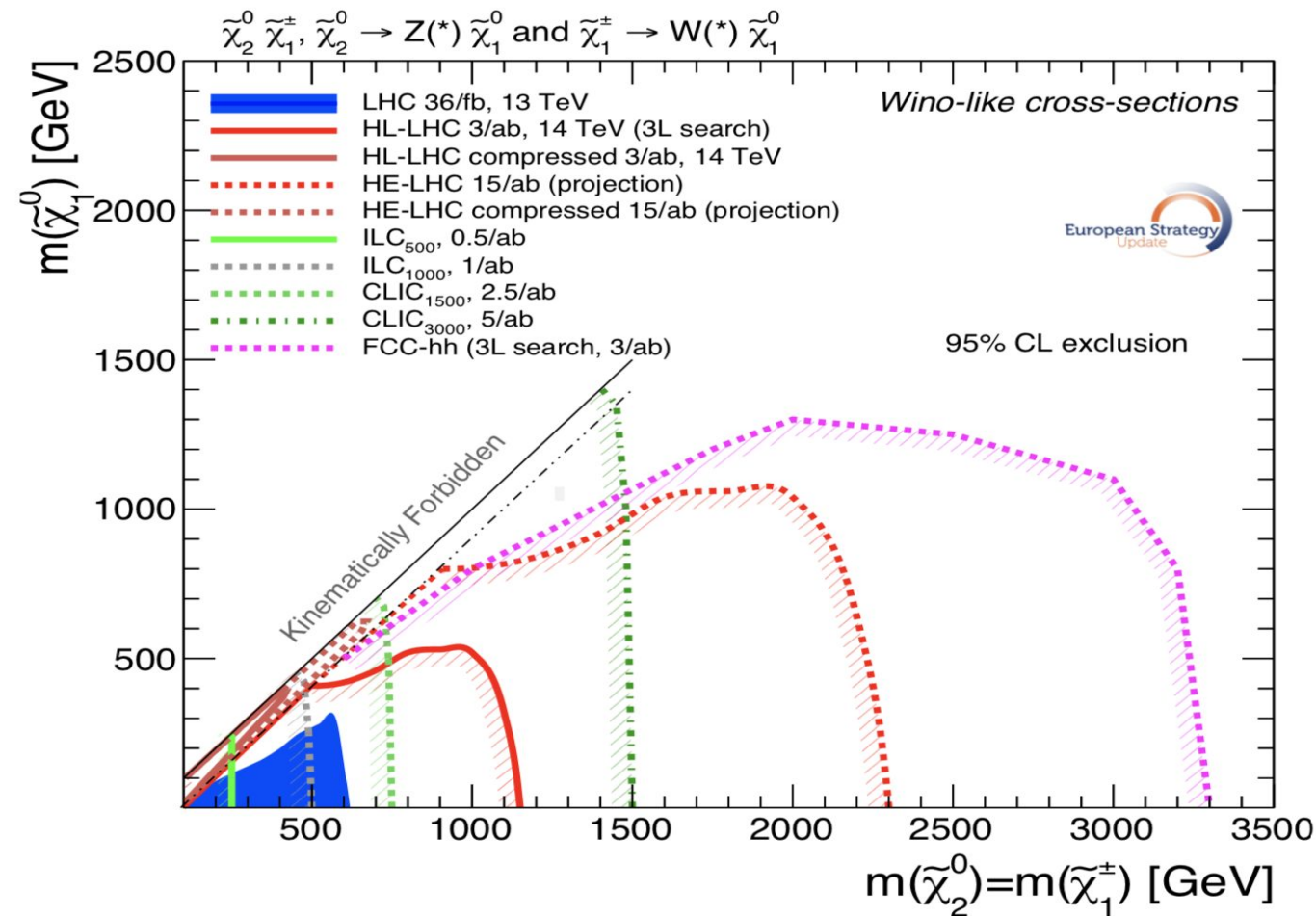


All Colliders: Top squark projections

(R-parity conserving SUSY, prompt searches)



Plots we want... EWK SUSY



What needs to change

- any issues with these? things that should be added/changed?
- add new hh collider energies, add muon collider
- (how) do we input pMSSM (include two lines per experiment?)
- Add all hadronic EWK (shown to be powerful at very large Δm)
- Understand monojet cut of at larger Δm (underway at Penn)

Summary

Restart of Snowmass Energy Frontier Officially July 1st

- Contributed paper deadline 3/15/22

Plan your MC needs

- This is key to making the deadlines and avoiding a scramble

Making sure your work gets in the EF08 report

- Fill in the form so we know how you are doing and what you plan to deliver: <https://forms.gle/qdgl5k35rqu9gusw9>

Help make sure the EF08 report has a broad view that is useful for scenario comparison

- Think about the plots and tables let us know what you think