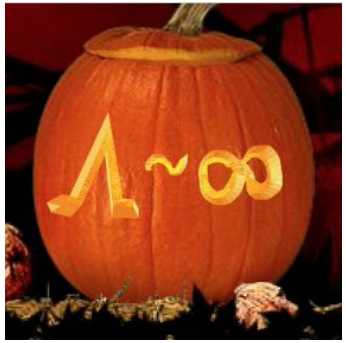
Snowmass 2021
EF09 - BSM



More general explorations

Tulika Bose, Zhen Liu, Simone Pagan Griso

https://snowmass21.org/energy/bsm_general

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WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

UNIVERSITY OF MARYLAND 18 56

BERKELEY LAB

Benchmark Discussion

Massive LLPs: benchmark for snowmass report

General considerations

- Impossible to cover all signals/searches, but aim to catch a wide variety of models in a few signatures to show as representative reach for different searches at different machines.
- Augmented with more specific models that show unique sensitivity in particular aspects
- Type of plot…
    i. mass vs lifetime
    ii. Mass reach
    iii. BR v.s. lifetime

Looking for volunteers to prepare summary plots for the report

Simplified modes:

- Colored LLP
  - (gluino, mini-split SUSY)
  - (LSP mass 0 GeV and 100 GeV mass gap)
  - (mass v.s. ctau)
- Non-colored LLP
  - (Higgsino, GMSB)
  - (decay via Higgs and Z, getting reach from both leptonic and hadronic decays)
  - (mass v.s. ctau)
- Higgs portal
  - (Higgs to LLPs, neutral naturalness)
  - (LLP mass 50 GeV, 10 GeV, 1 GeV)
  - (Br v.s. ctau)
- Disappearing Track
  - (Higgsino reach and Wino reach)
  - (mass reach at different colliders)

- Dark Shower benchmarks are currently under discussion with a group (contact Marie-Hélène, Caterina and Suchita if you want to join https://indico.cern.ch/event/970758/)
- Light LLP benchmark are current under discussion with RF6 (Natalia Toro et al.)
- Beyond simplified modes

These new modes show unique physics potentials from contributed papers (LOIs/EOIs so far)

Production \ Decay	$\gamma\gamma(+\text{inv.})$	$\gamma+\text{inv.}$	$jj(+\text{inv.})$	$jj\ell$	$\ell^+\ell^-(+\text{inv.})$	$\ell_\alpha^+\ell_{\beta\neq\alpha}^-(+\text{inv.})$
DPP: sneutrino pair	†	SUSY	SUSY	SUSY	SUSY	SUSY
HP: squark pair, $\tilde{q}\to jX$ or gluino pair $\tilde{g}\to jjX$	†	SUSY	SUSY	SUSY	SUSY	SUSY
HP: slepton pair, $\tilde{\ell}\to\ell X$ or chargino pair, $\tilde{\chi}\to WX$	†	SUSY	SUSY	SUSY	SUSY	SUSY
HIG: $h\to XX$ or $\to XX+\text{inv.}$	Higgs, DM*	†	Higgs, DM*	RHν	Higgs, DM* RHν*	RHν*
HIG: $h\to X+\text{inv.}$	DM*, RHν	†	DM*	RHν	DM*	†
RES: $Z(Z')\to XX$ or $\to XX+\text{inv.}$	Z', DM*	†	Z', DM*	RHν	Z', DM*	†
RES: $Z(Z')\to X+\text{inv.}$	DM	†	DM	RHν	DM	†
CC: $W(W')\to\ell X$	†	†	RHν*	RHν	RHν*	RHν*

Production \ Decay	$\ell+\text{inv.}$	$jj(+\text{inv.})$	$jj\ell$	$\ell\gamma$
DPP: chargino pair or slepton pair	SUSY	SUSY	SUSY	
HP: $\tilde{q}\to jX$	SUSY	SUSY	SUSY	
ZP: $Z'\to XX$	Z', DM*	Z', DM*	Z'	
CC: $W'\to X+\text{inv.}$	DM*	DM*		

Production \ Decay	$j+\text{inv.}$	$jj(+\text{inv.})$	$j\ell$	$j\gamma$
DPP: squark pair or gluino pair	SUSY	SUSY	SUSY	

From the theory section of LLP community report 1903.04497