Digging into the LHC Results

André Lessa

Santo André, SP, Brazil

PHENOEXP 2018

Buenos Aires, May 9th, 2018

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(from a theorist's perspective)

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Data vs Models

- *Testing your favorite BSM model:*
  - What do we want to know?
    - ★ Is the model excluded/allowed?
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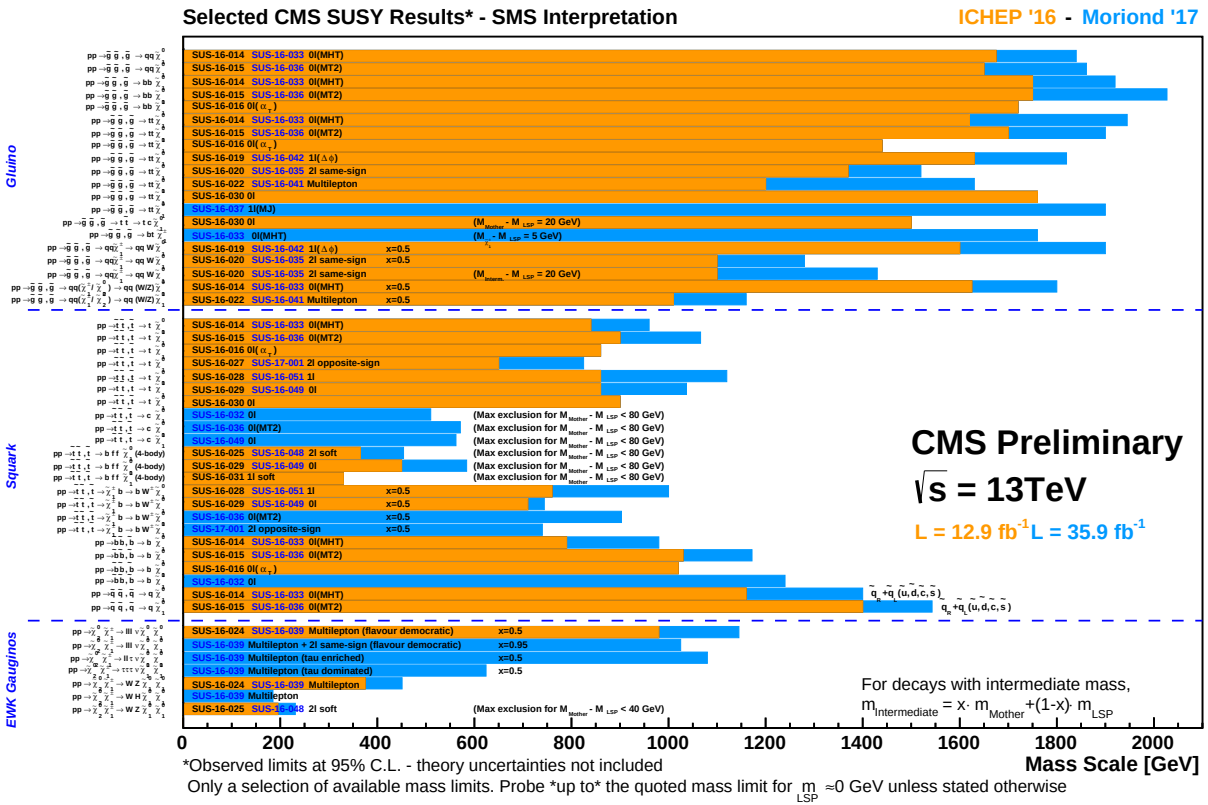

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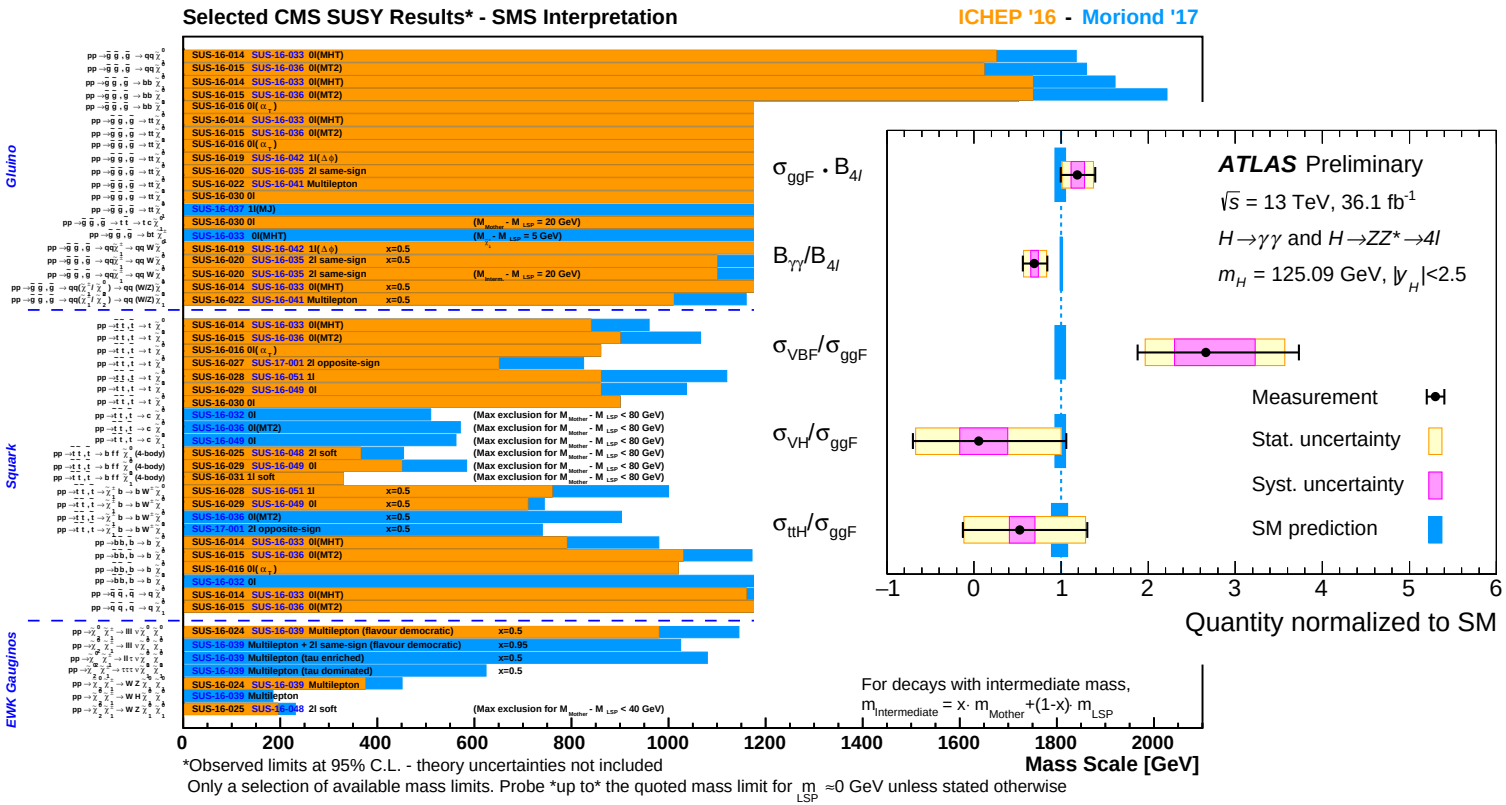

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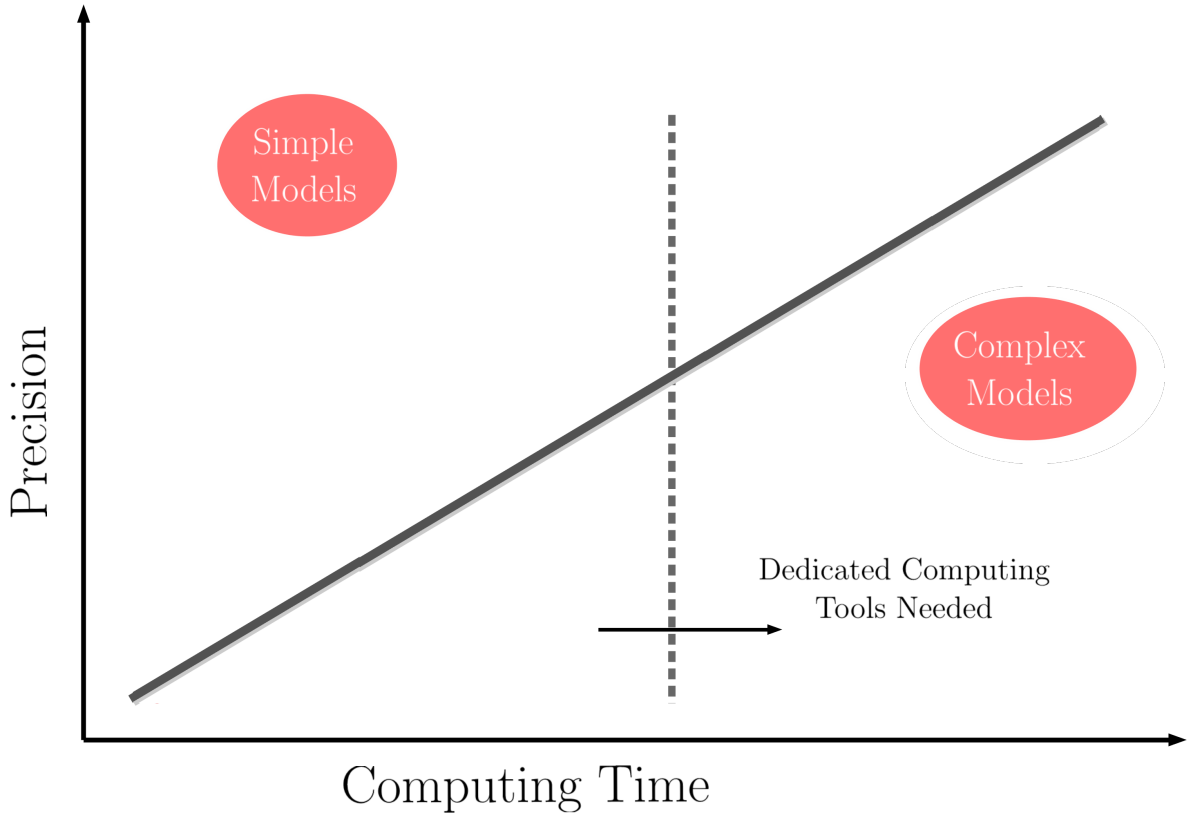

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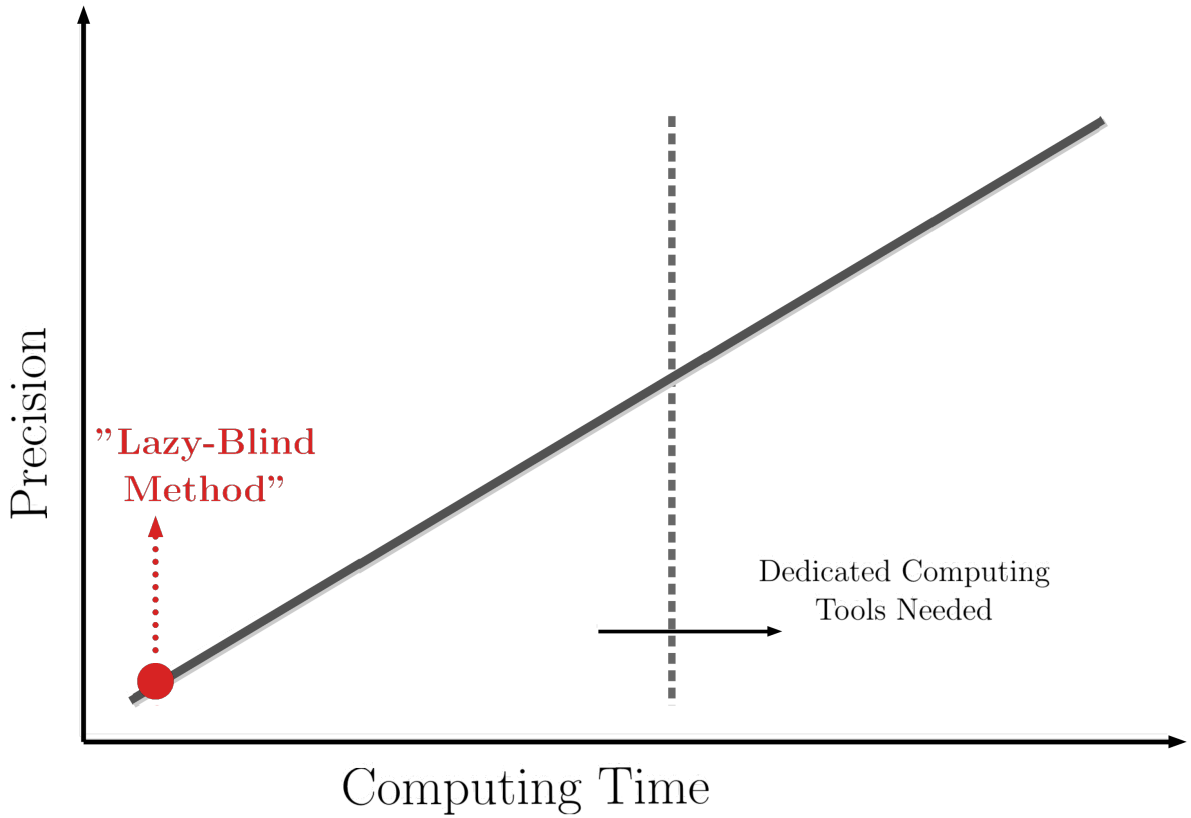

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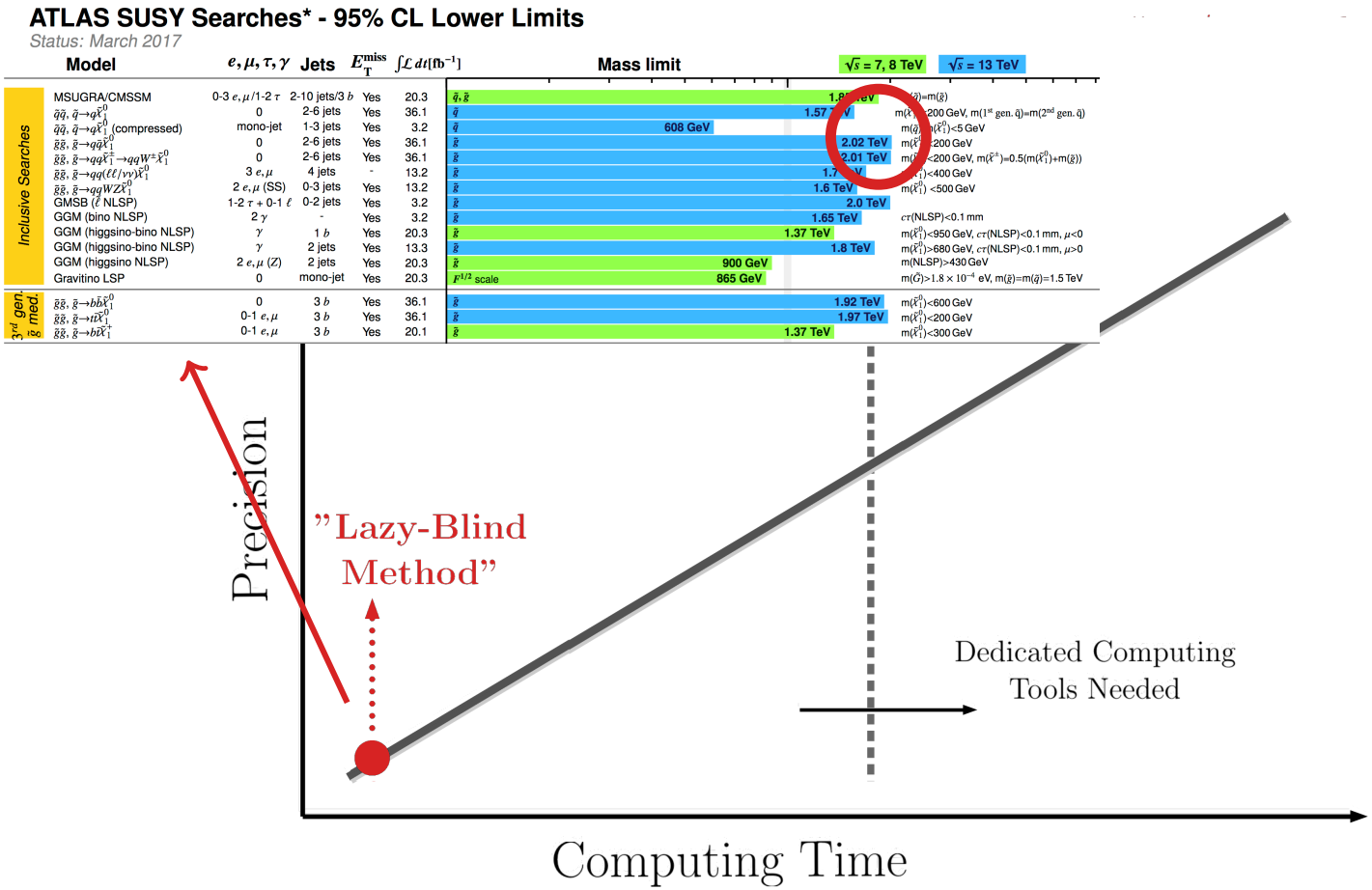

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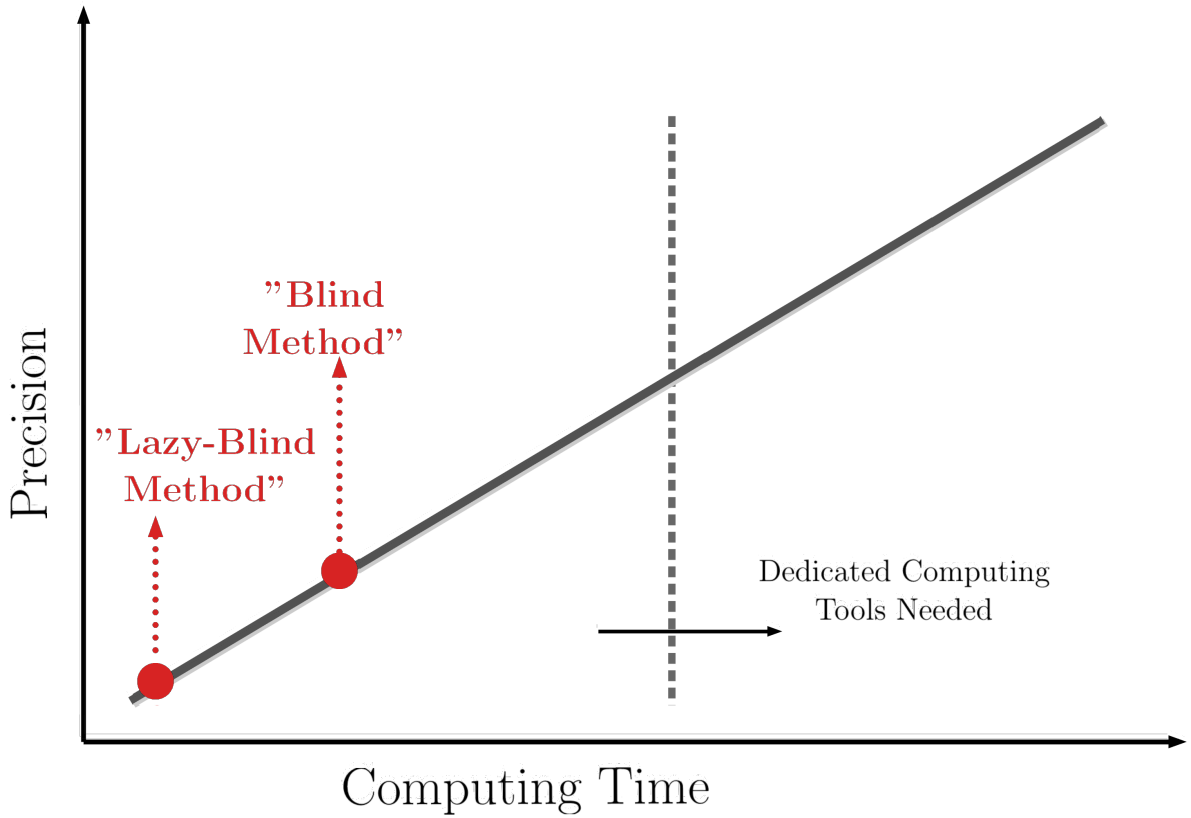

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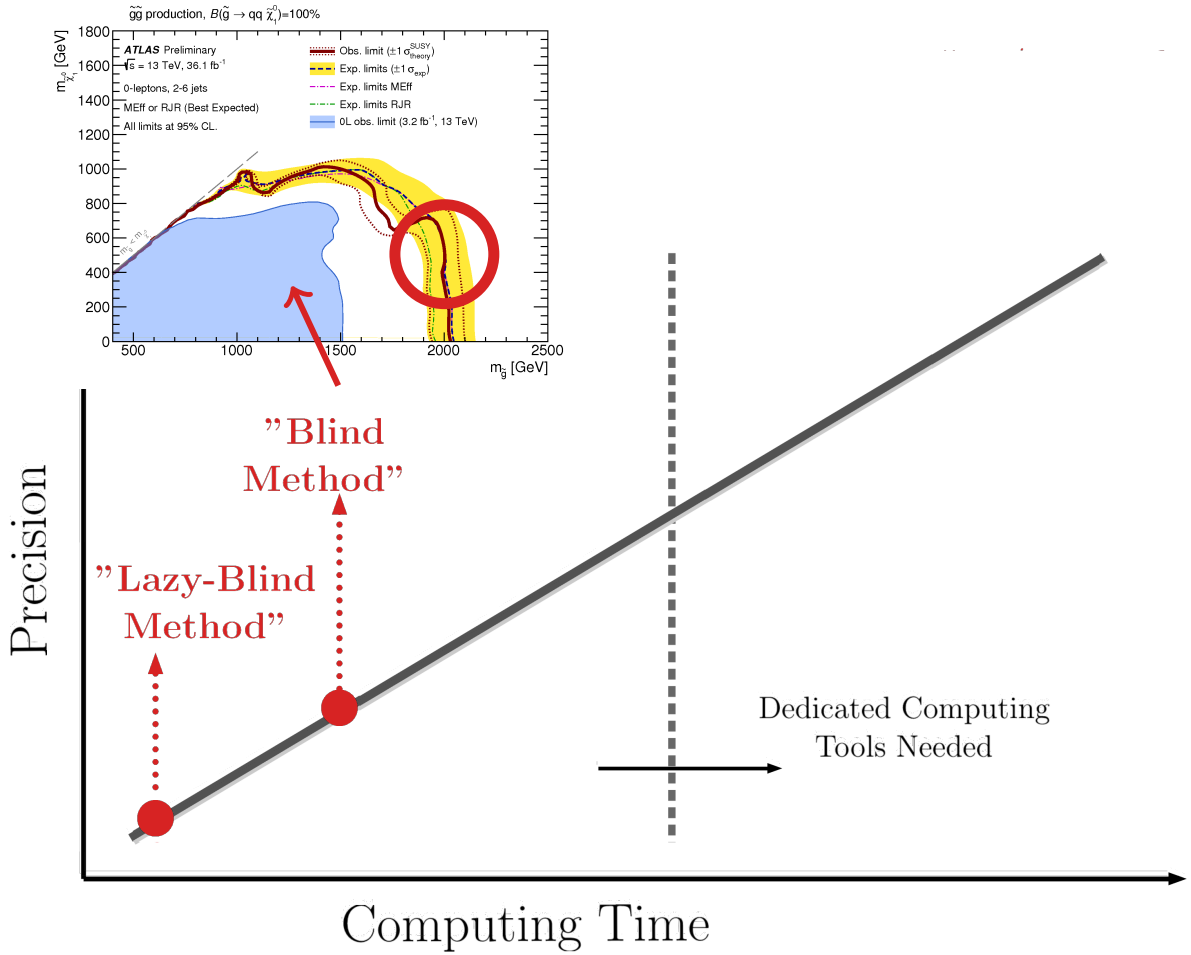

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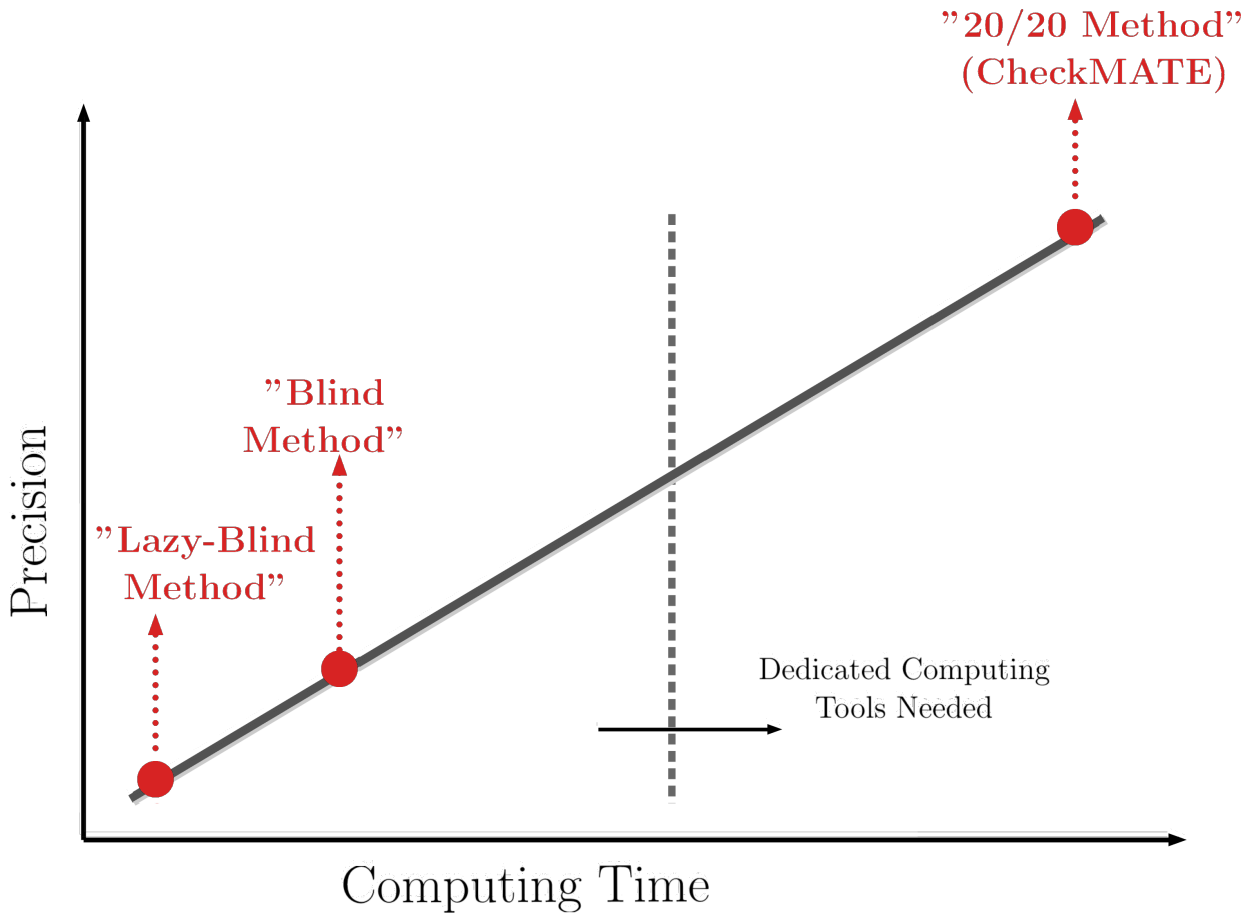

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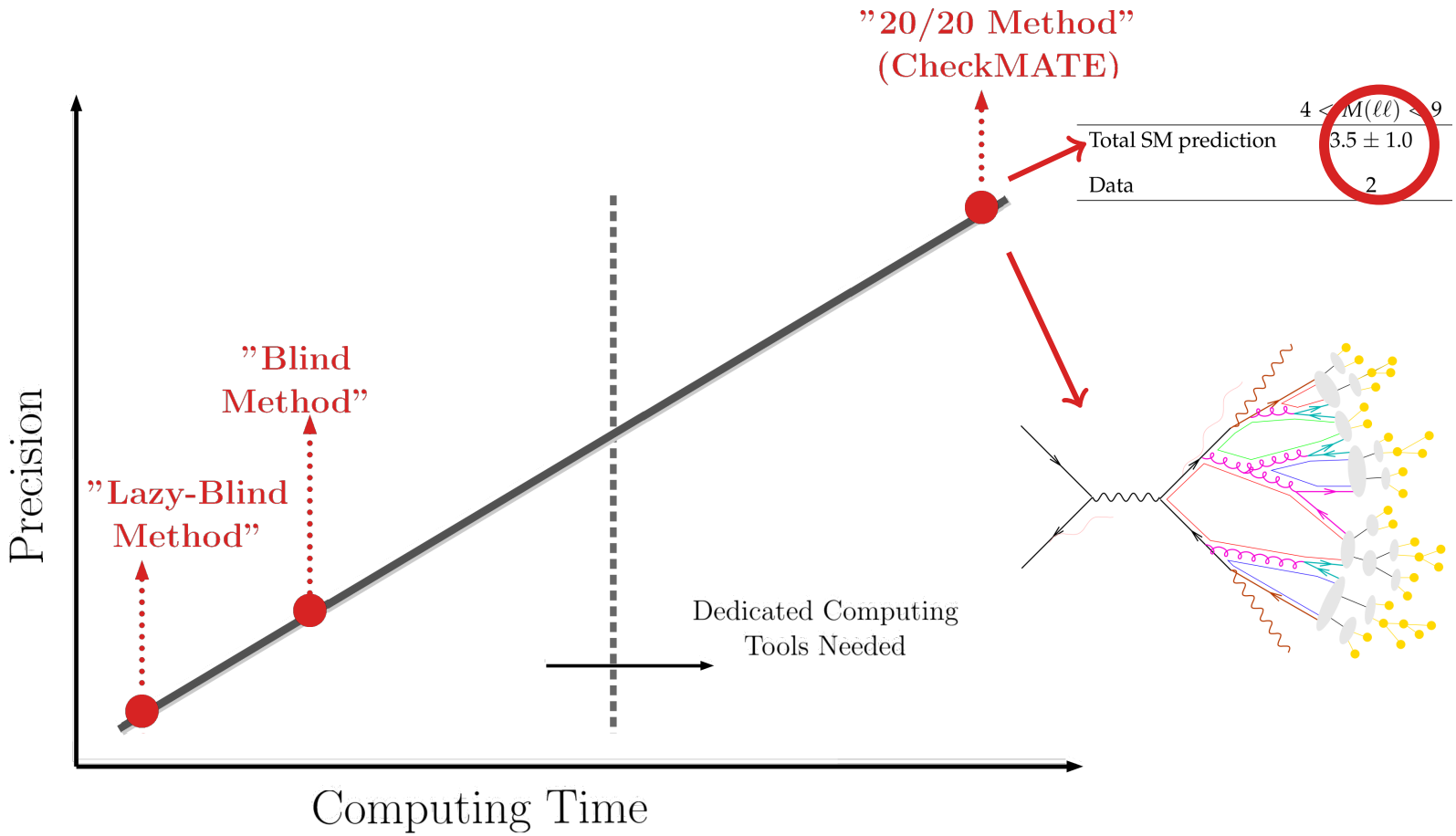

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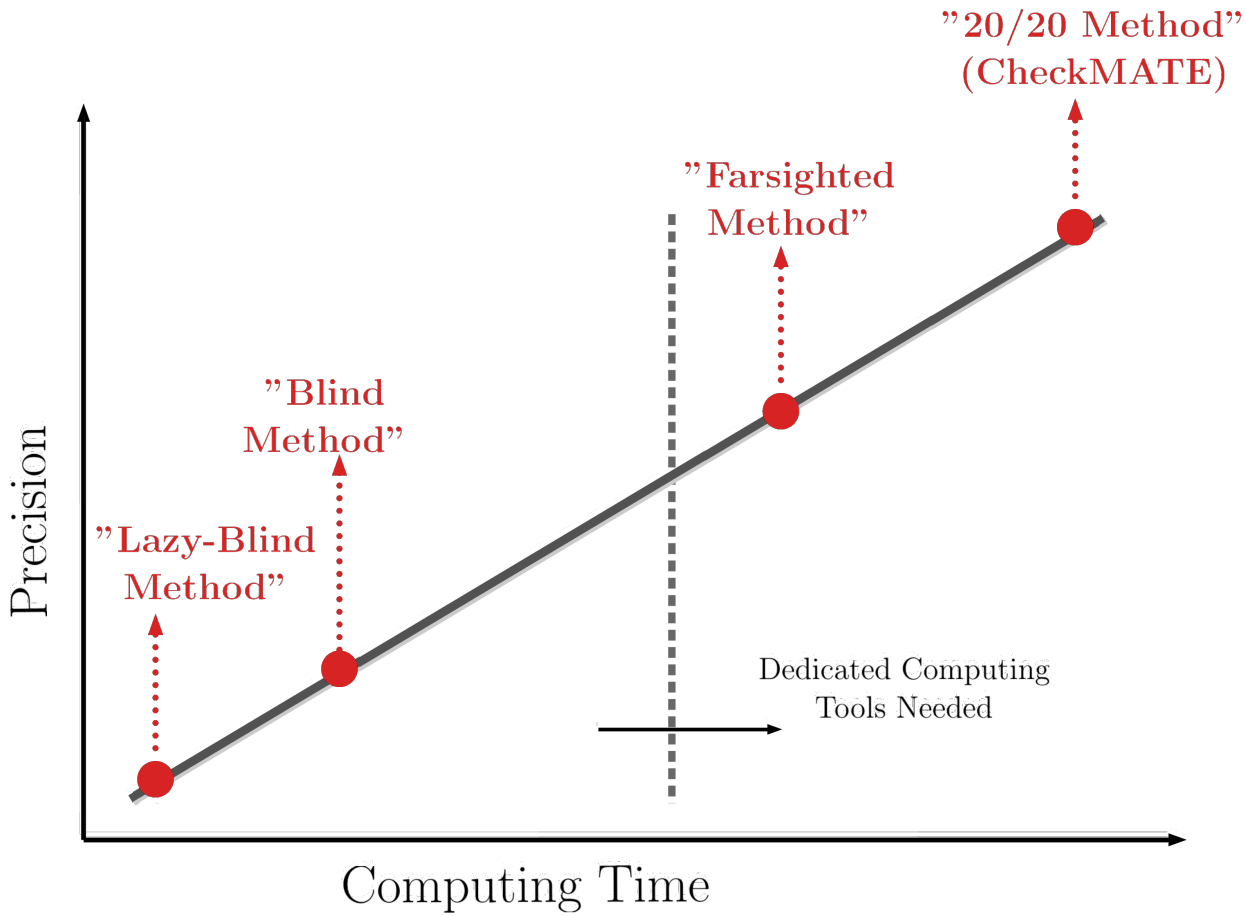

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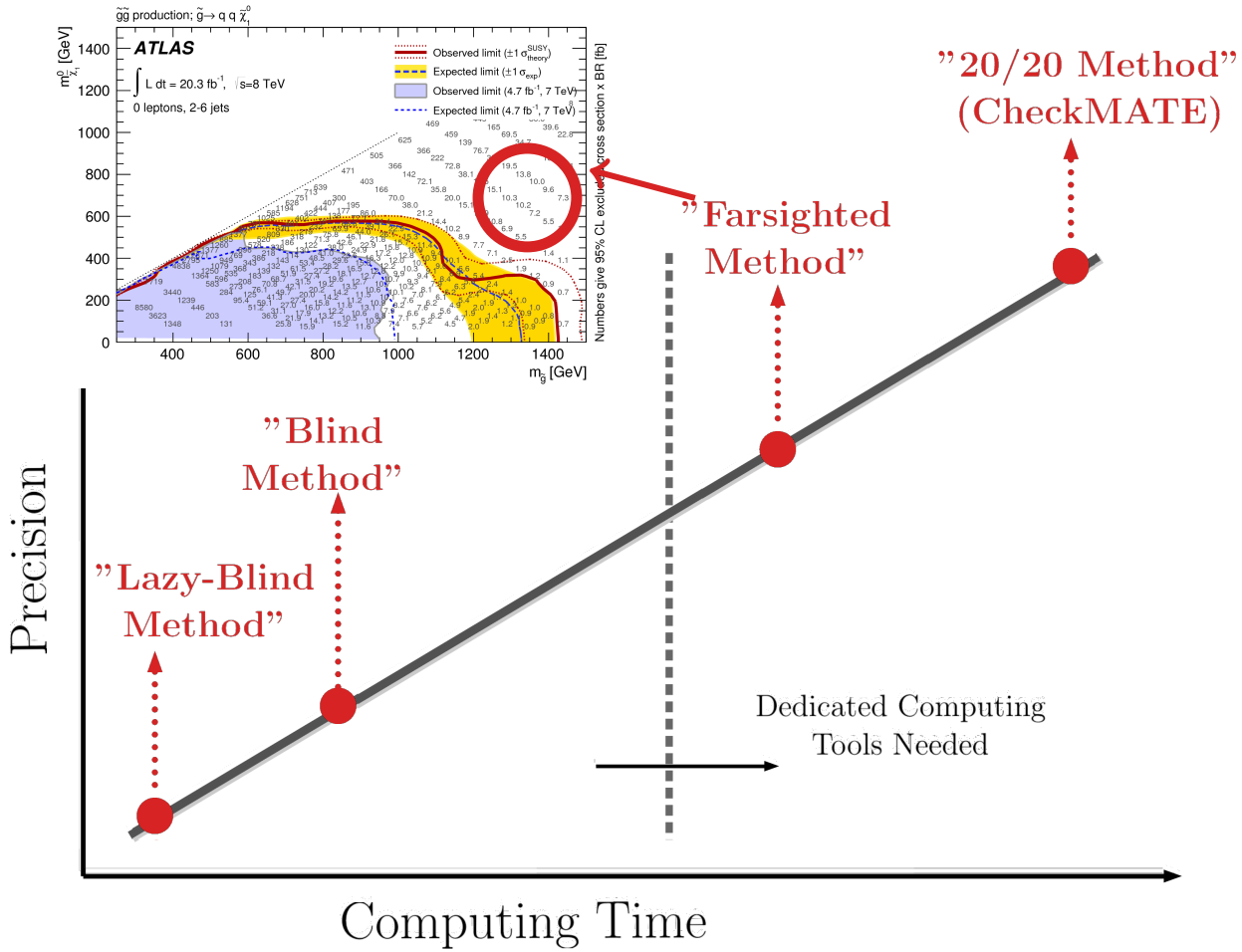

SModelS

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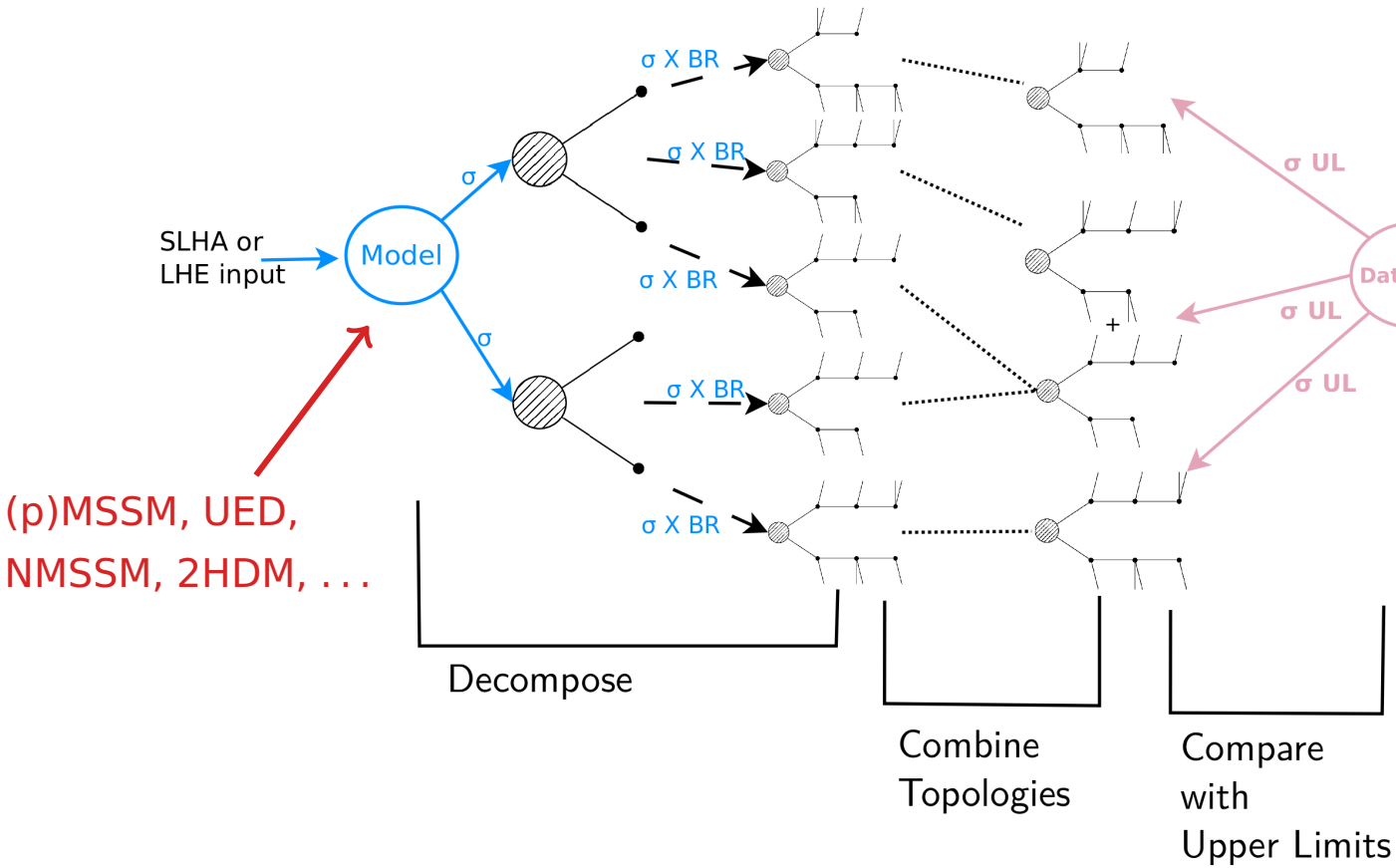

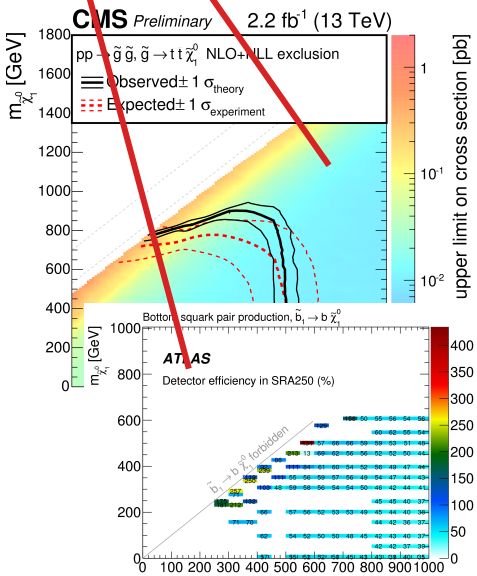

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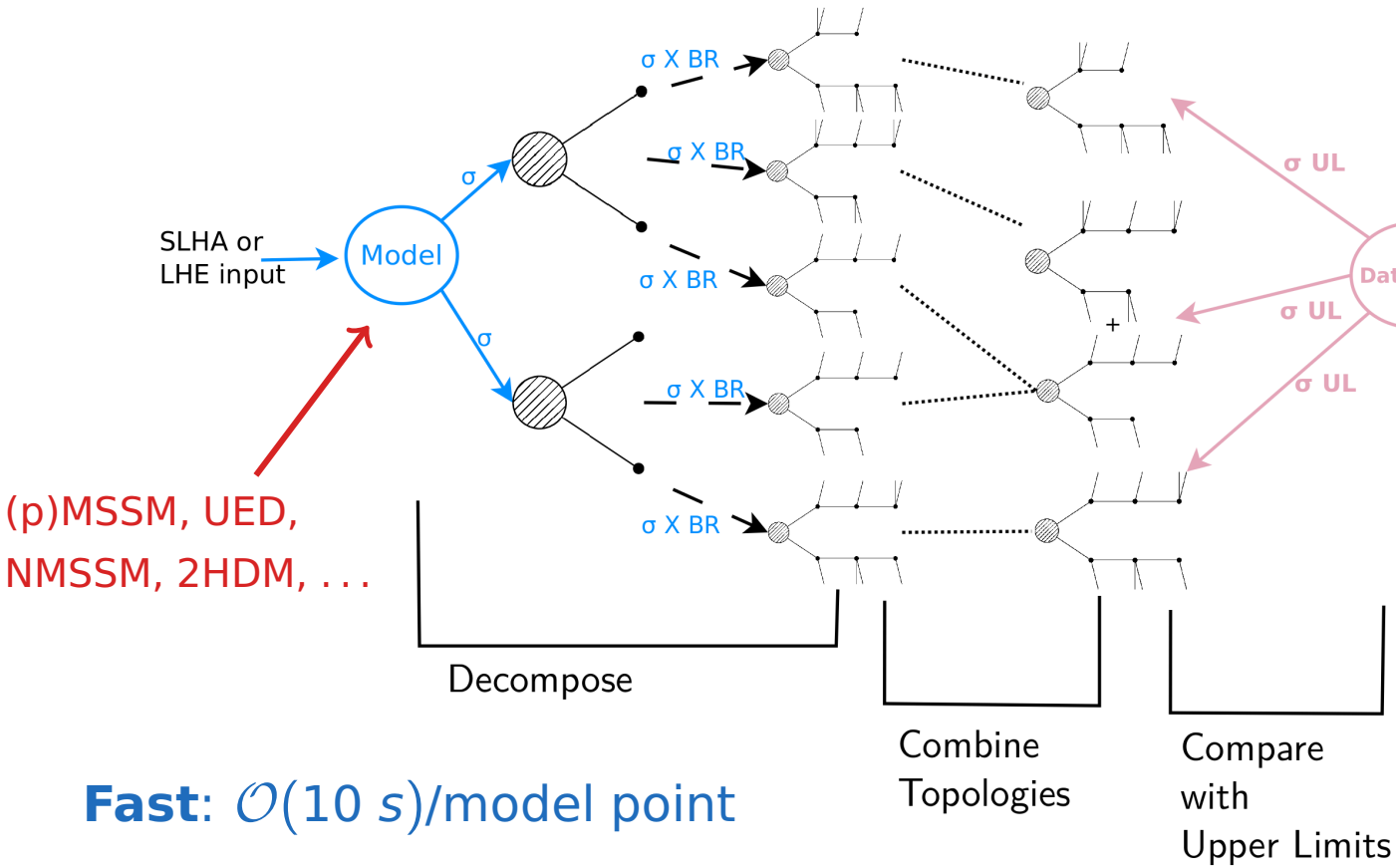

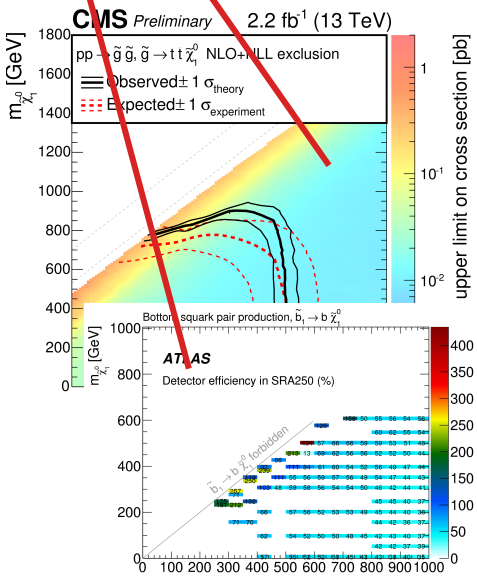

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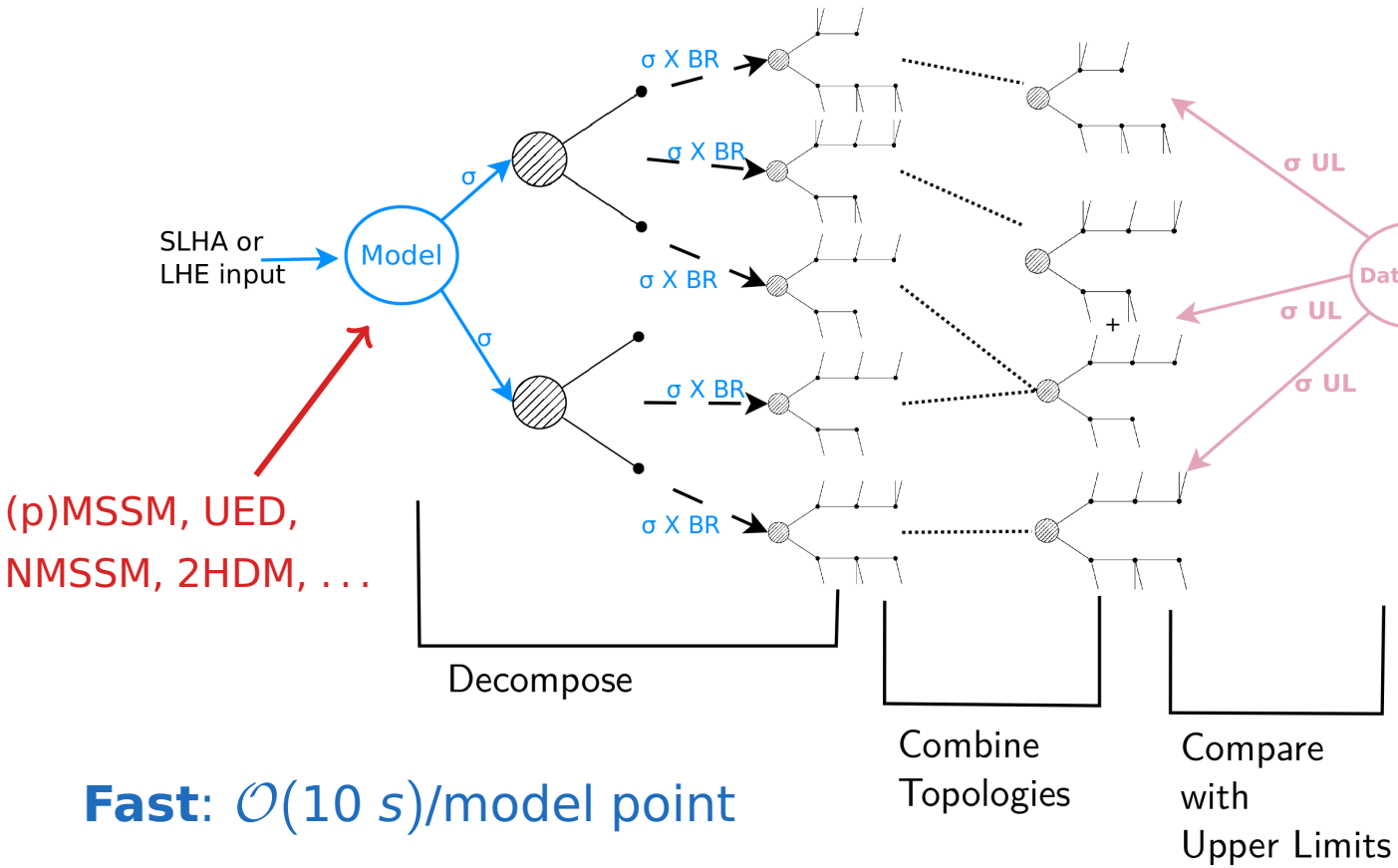

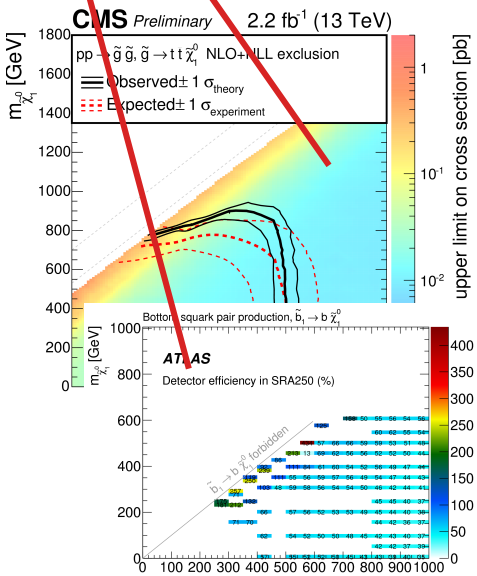

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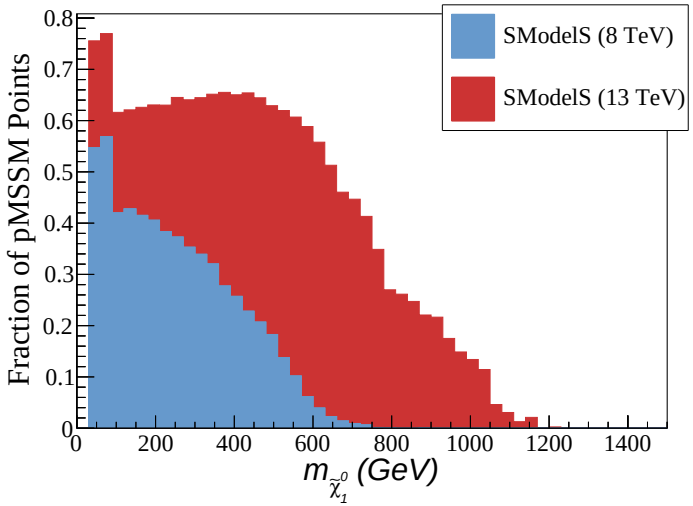
- It can be used to test many BSM models

SModelS has been successfully applied to several scenarios:

- pMSSM (F. Ambrogi et al, *"On the coverage of the pMSSM by simplified model results"*)
- NMSSM (S. S. AbdusSalam, *"A phenomenological NMSSM race for 125 GeV Higgs boson"*)
- Light stops (G. Belanger, D. Ghosh, R. Godbole, and S. Kulkarni, *"Light stop in the mssm after lhc run 1"*)
- MSSM+$U(1)$ extensions (G. Belanger, J. Da Silva, and H. M. Tran, *"Dark matter in U(1) extensions of the MSSM with gauge kinetic mixing"*)
- $SO(10)$ models (T. Fukuyama, N. Okada, and H. M. Tran, *"Sparticle spectroscopy of the minimal SO(10) model"*)
- IDM+PQ symmetry (A. Alves et al, *"Collider and Dark Matter Searches in the Inert Doublet Model from Peccei-Quinn Symmetry"*)
- ...

- Current Status and (Near) Future
  - Efficiency maps
  - 13 TeV (CMS) results



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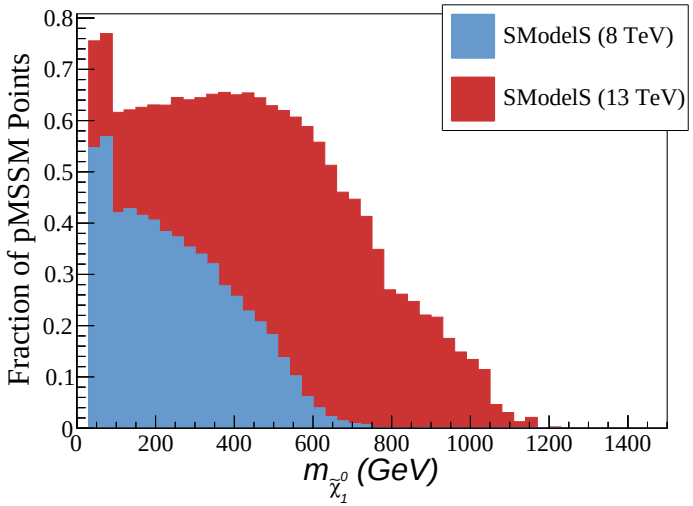
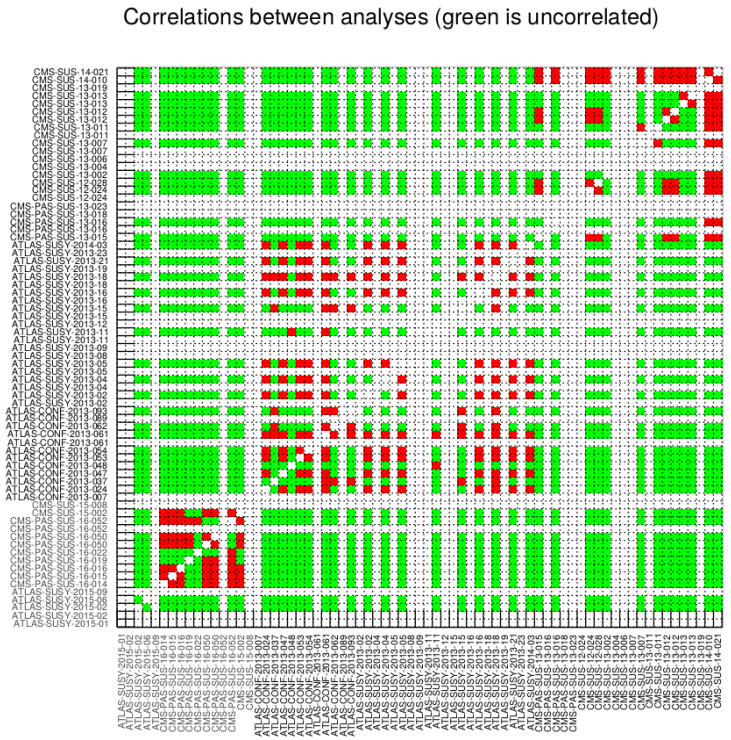


  - Covariance matrices (simplified likelihood)



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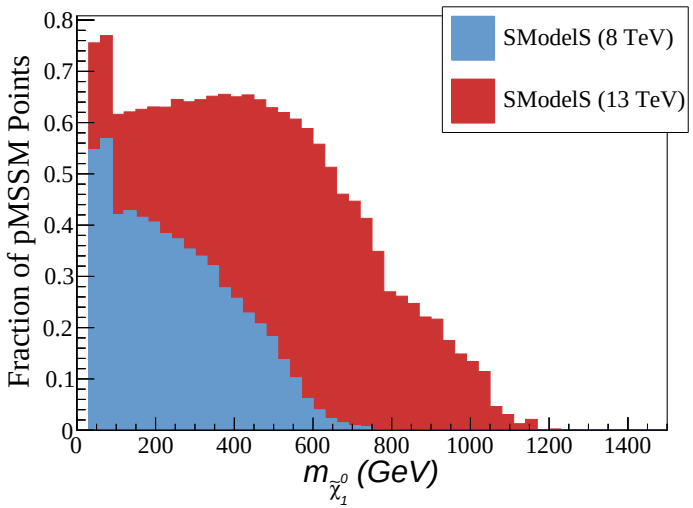

  - Extension to handle models with Long-Lived Particles (LLPs)
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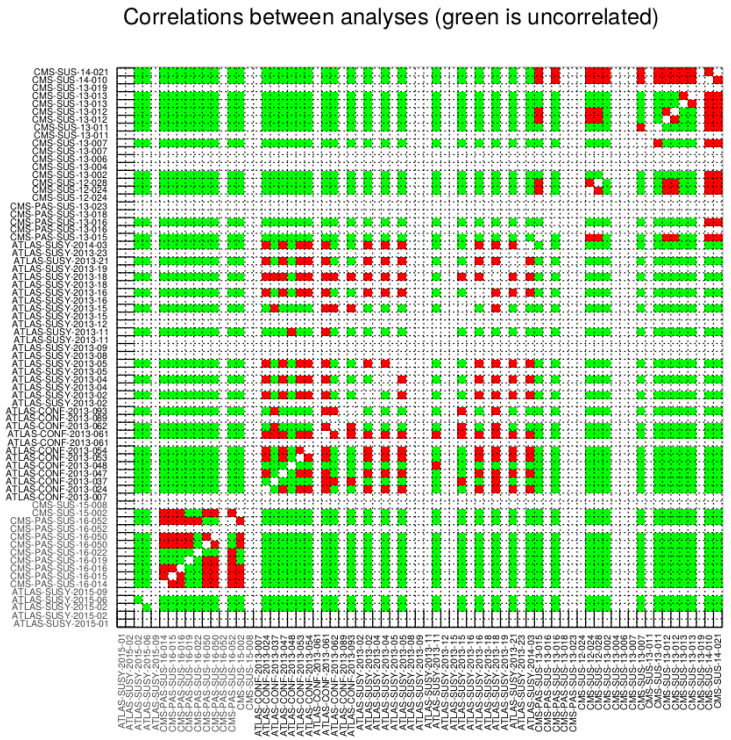

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- LLPs can appear in:
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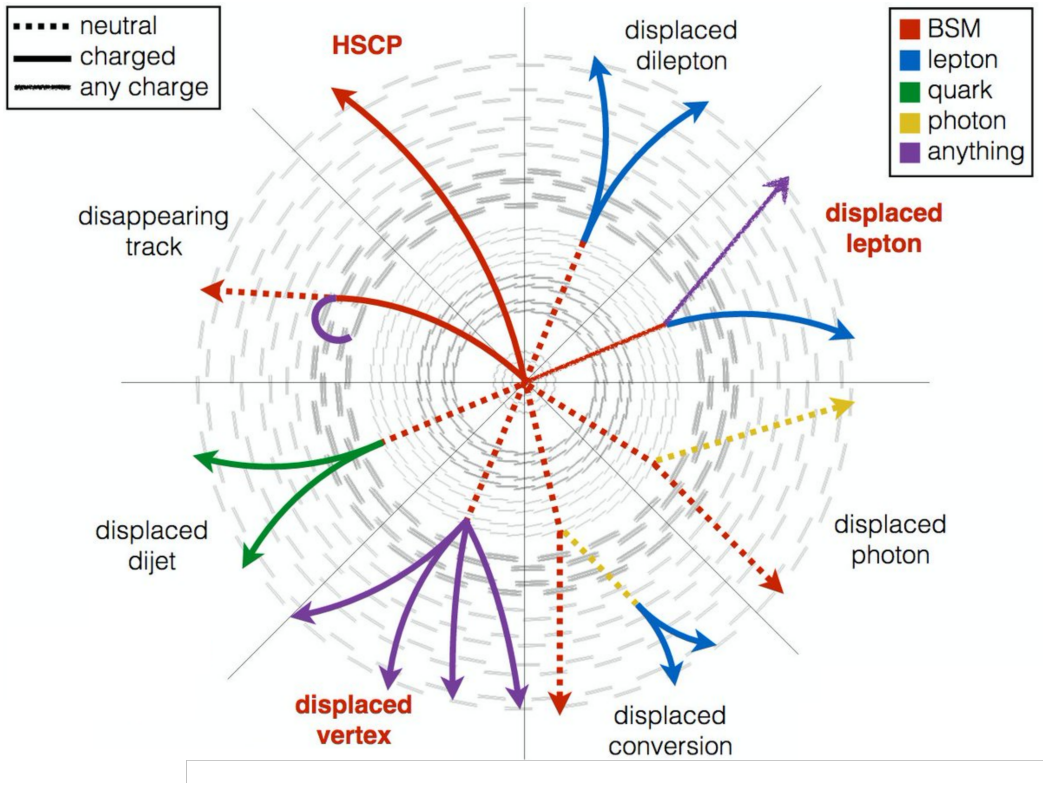

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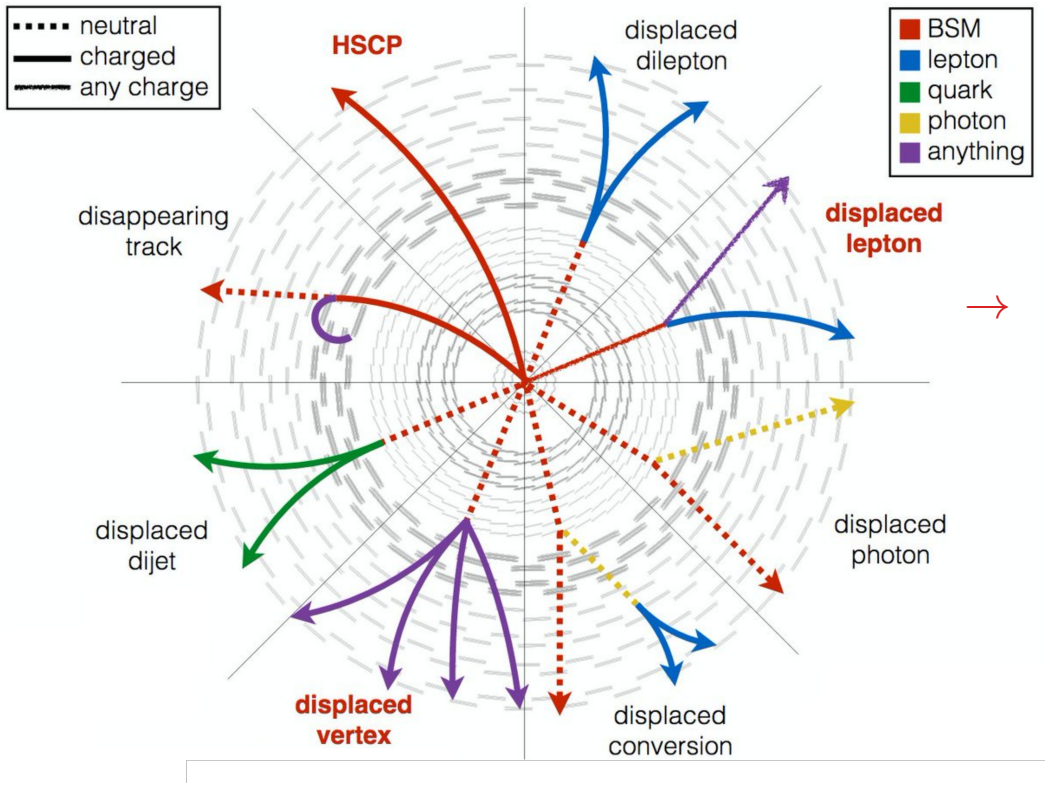

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The signal efficiency strongly depends on the lifetime → additional parameter

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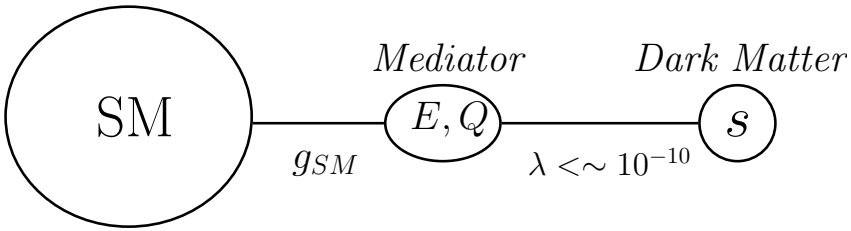

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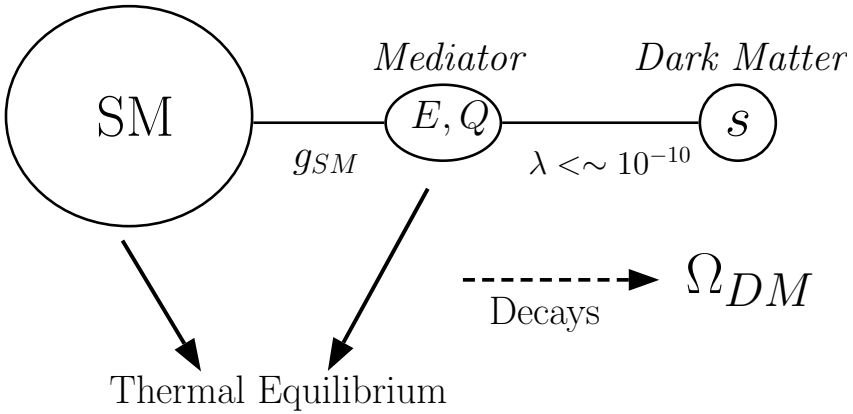

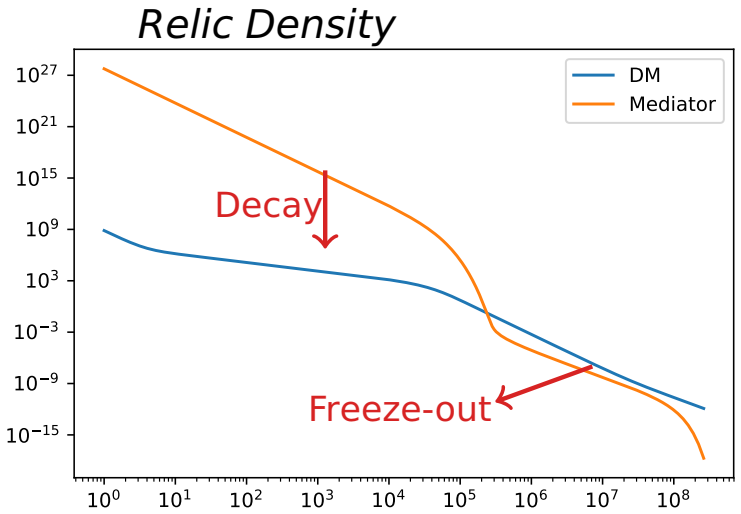

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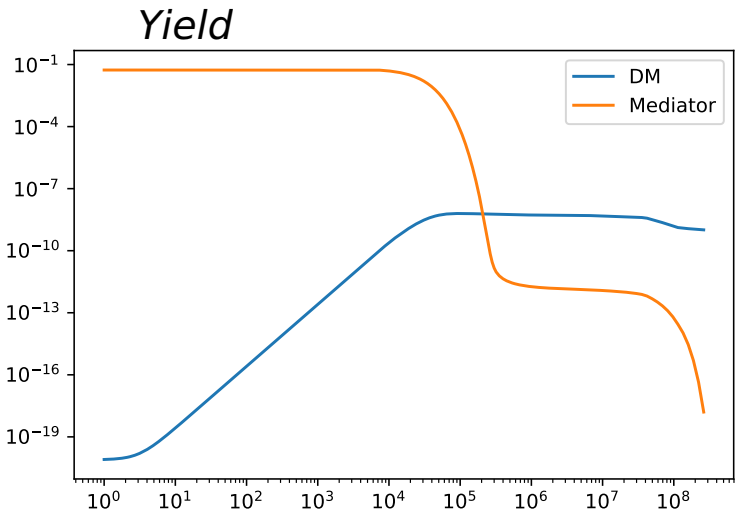

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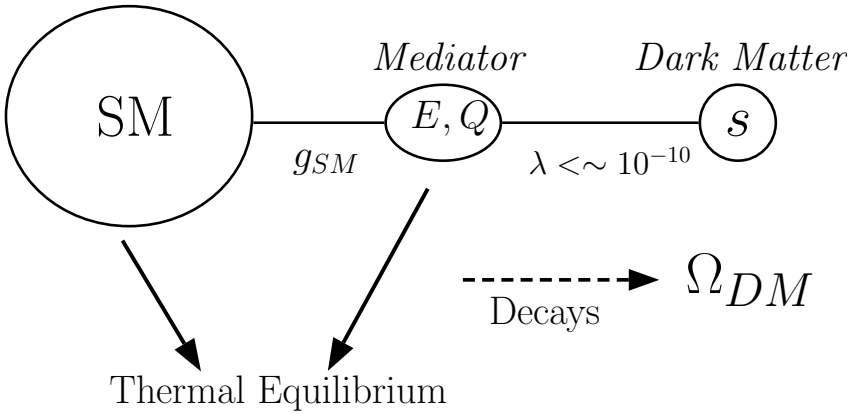

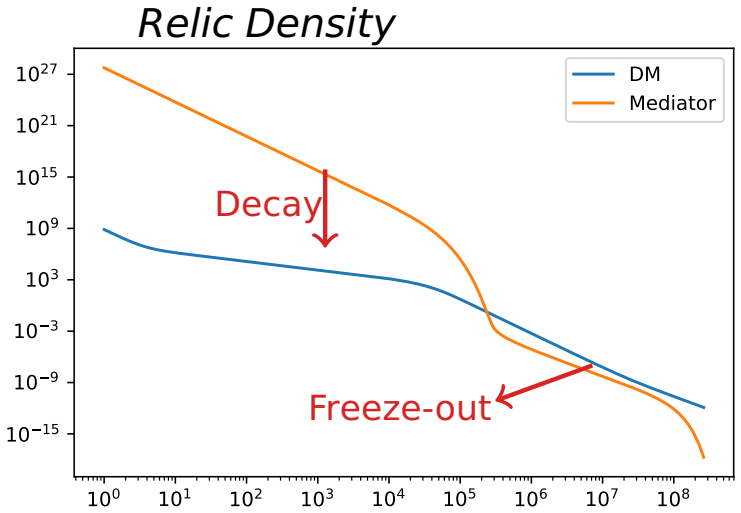

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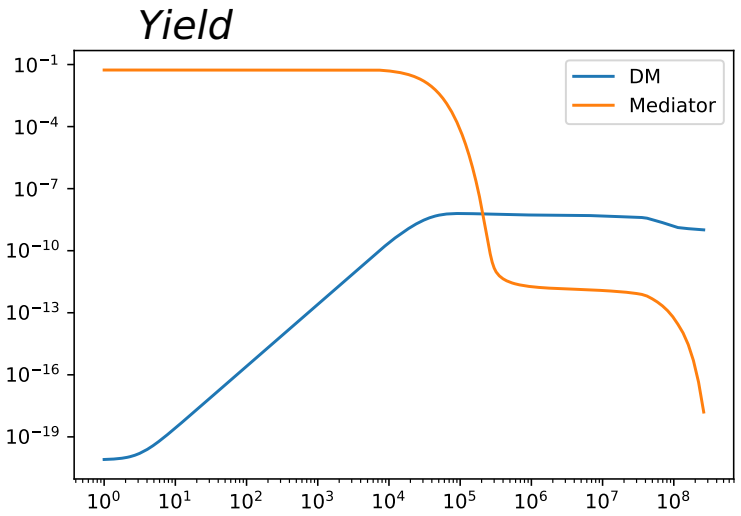
Invisible at direct detection experiments!



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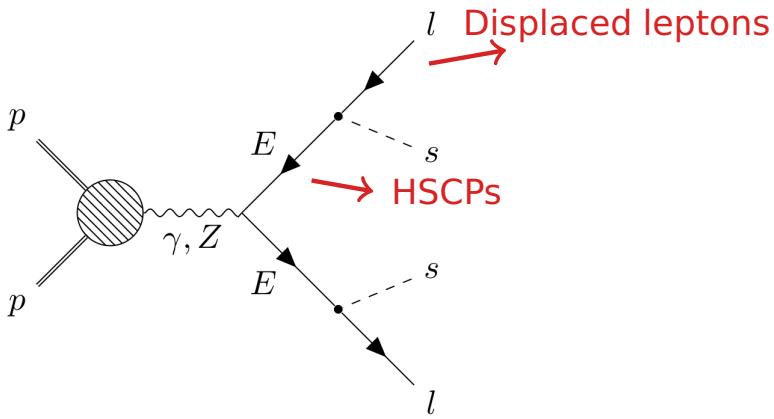

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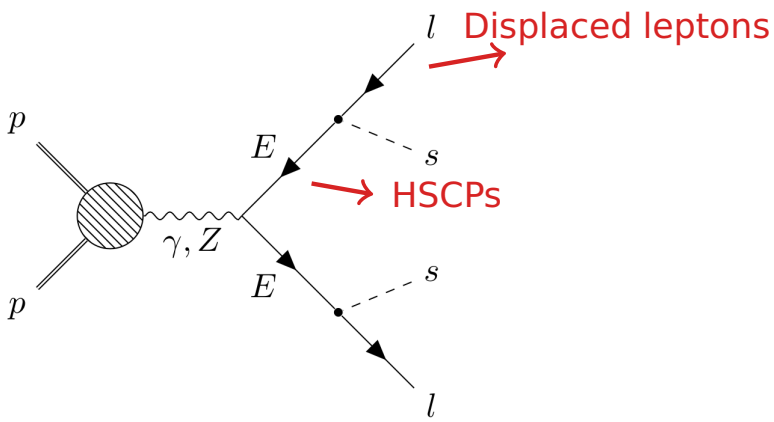

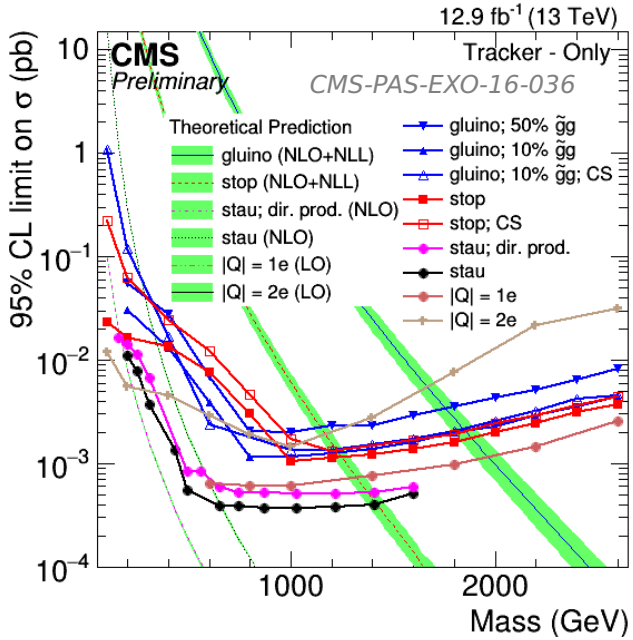

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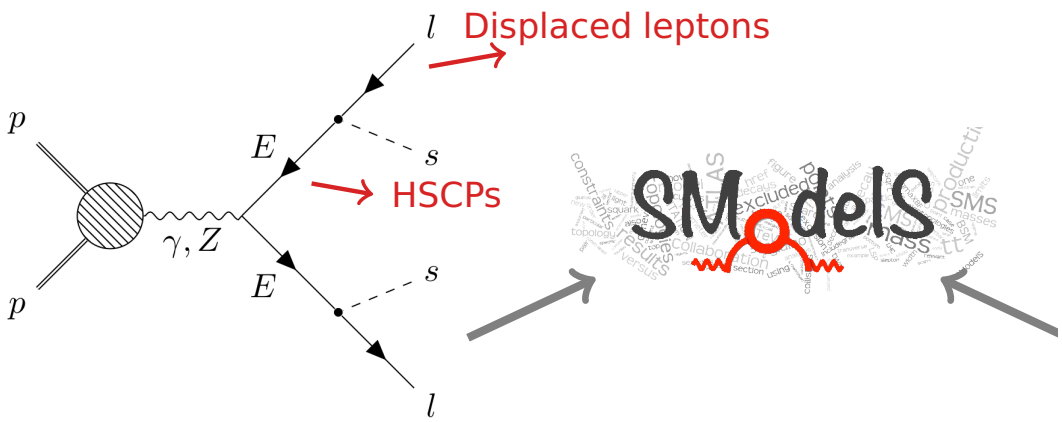

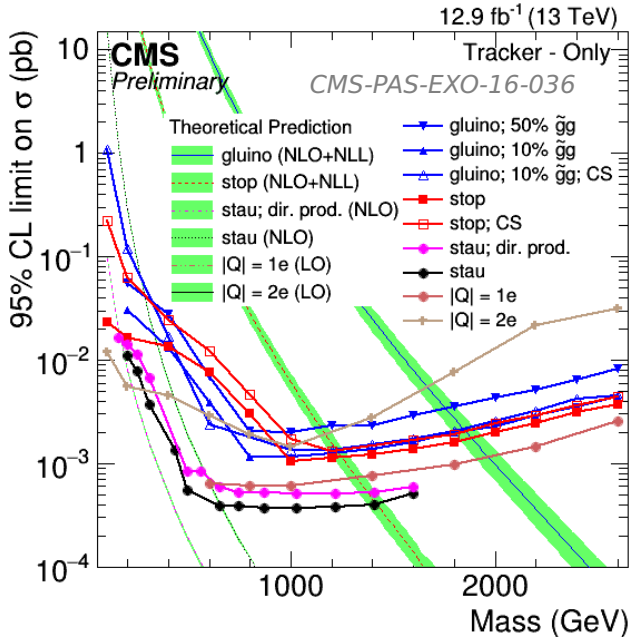

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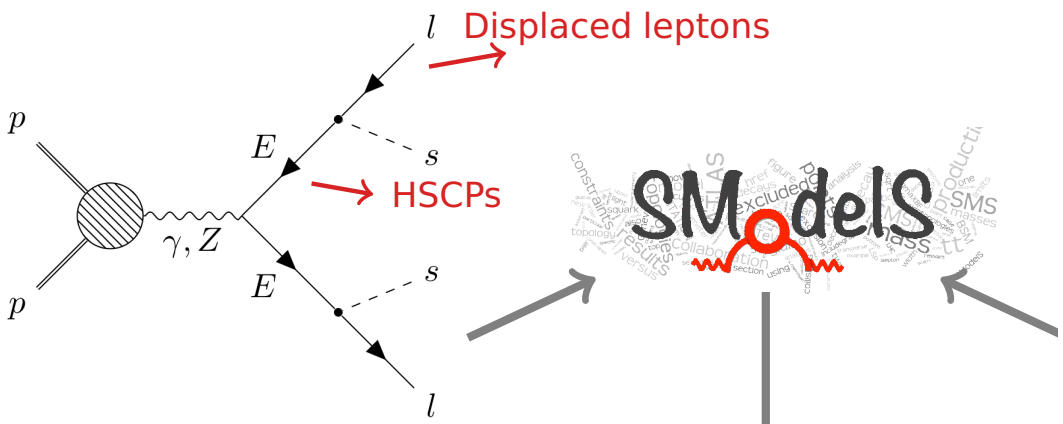

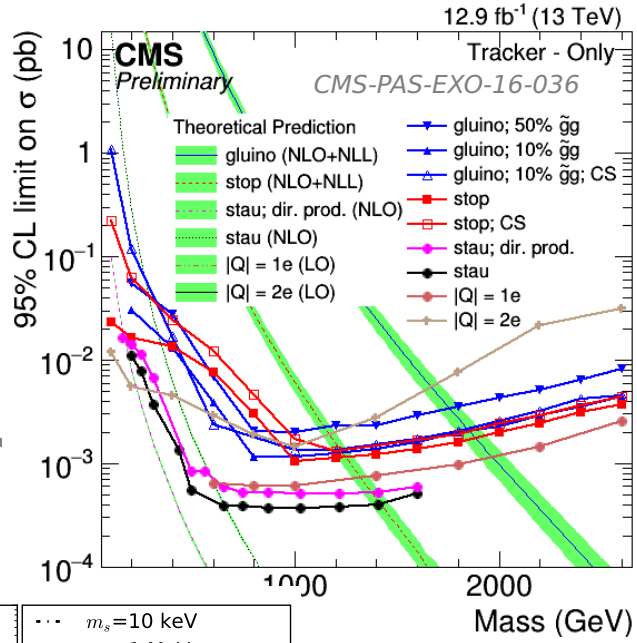

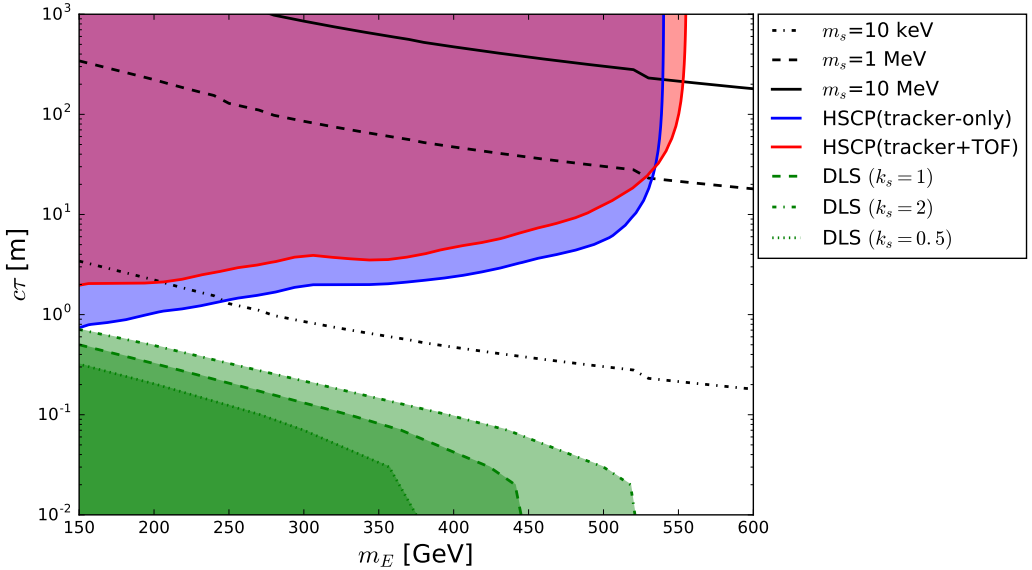

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More info:

smodels.hephy.at and github.com/SModelS

Thanks!