Global Fits of sub-GeV Dark Matter

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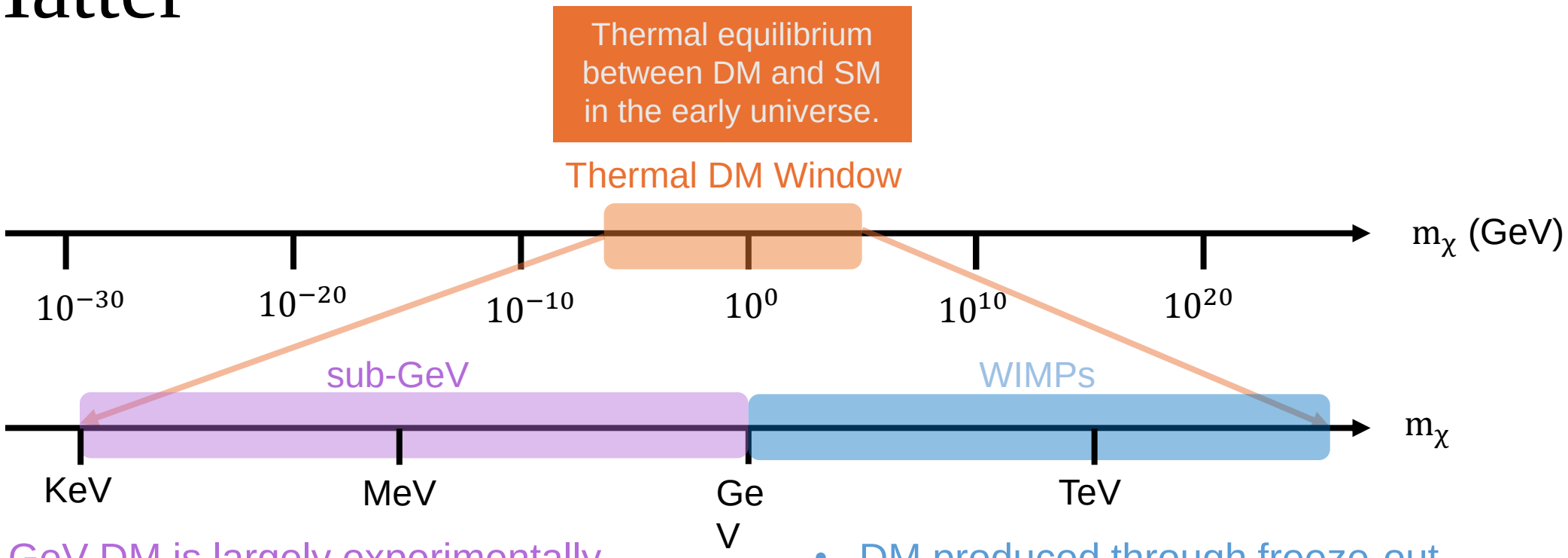
Sub-GeV Dark Matter



- Sub-GeV DM is largely experimentally **unexplored**..
  - Out of reach of nuclear recoil direct detection exps
  - Electron recoils and accelerator exps

- DM produced through freeze-out near weak scale
- GeV-TeV scale thermal DM already widely tested

Global Fits

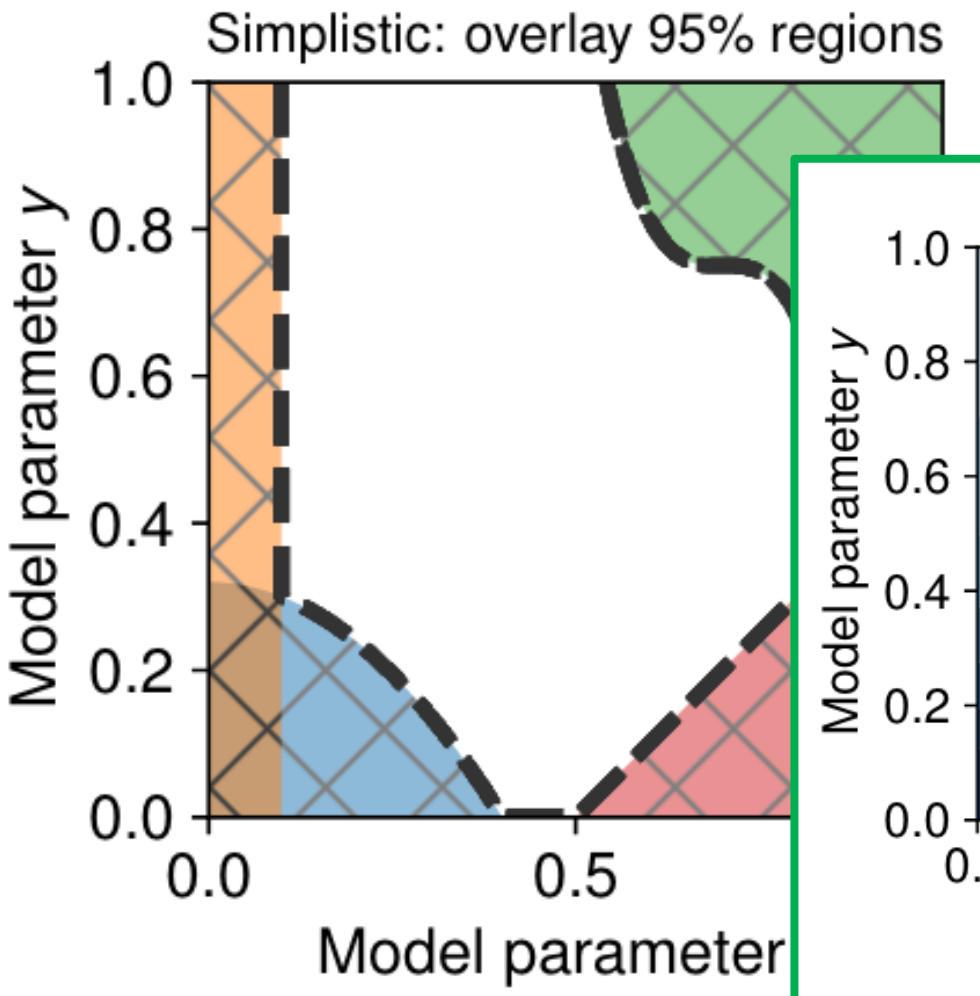
Many experiments with their own exclusion bounds.

If you approximate the combined exclusion bound as the intersection..

Error rate = $1 - 0.95^n$

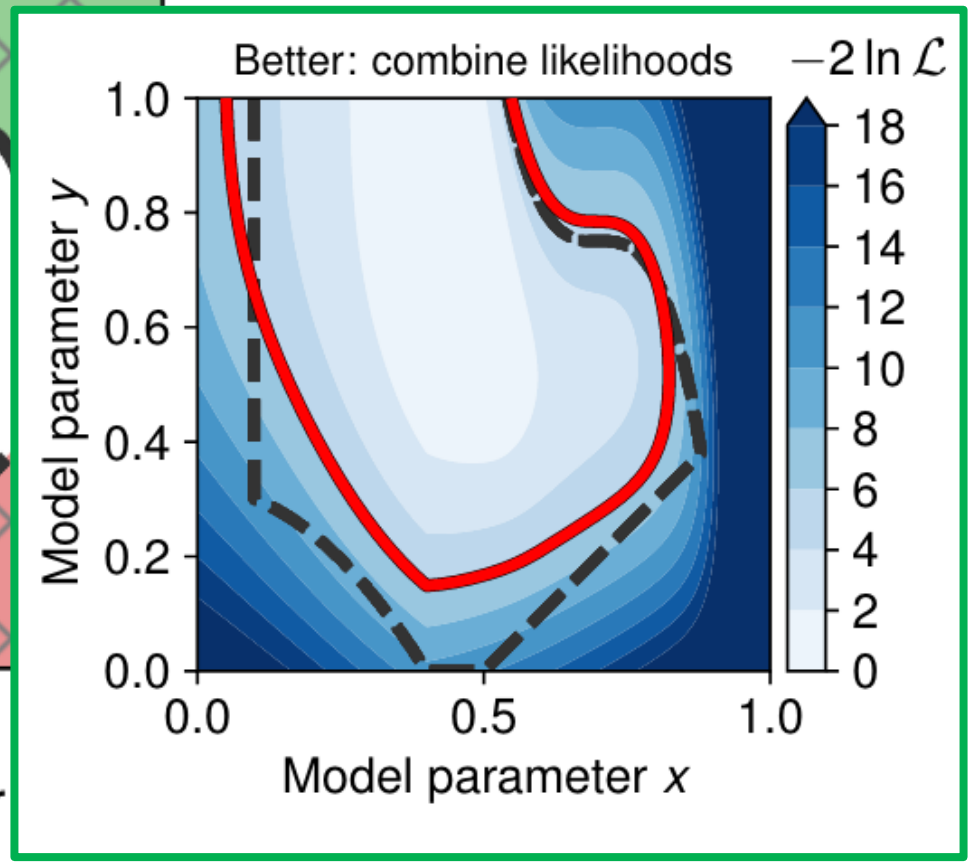
Example: 5 experiments

- error rate $= 1 - 0.95^5 =$ 23%
- falsely reporting 95% C.L.



Composite likelihood function,

$\mathcal{L}_{\text{total}} = \mathcal{L}_{\text{DD}} \times \mathcal{L}_{\text{ID}} \times \mathcal{L}_{\text{Collider}} \times \ldots$



Global Fits of sub-GeV DM

Bayesian and **Frequentist** scans of **complex scalar** and **Dirac fermion** DM

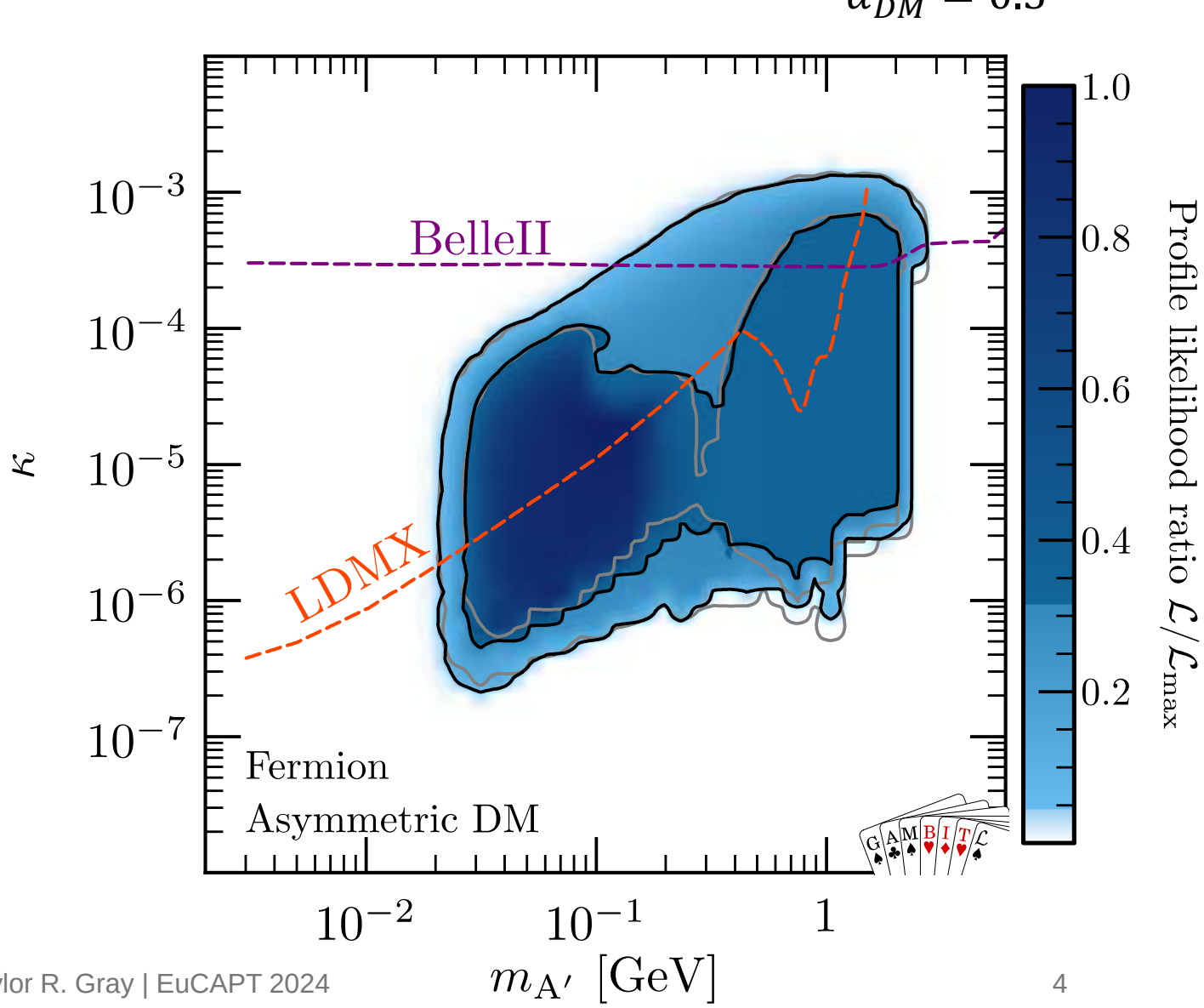
We consider constraints from:

- Cosmology
- Astrophysics
- Accelerator experiments
- Direct detection

Dirac fermion DM subject to strong constraints from indirect detection

- Relax by introducing asymmetry

Near-future experiments can probe significant parts of the allowed parameter space



Summary

- Global fits on models of **sub-GeV DM with a dark photon** using implementation of **GAMBIT**

- Fermionic DM
  - Preferred region is resonant freeze-out
  - Or, introduce asymmetry

- Scalar DM
  - Weak indirect detection constraints
  - Subject to constraints from fixed target/collider experiments