Light DM @ Accelerators

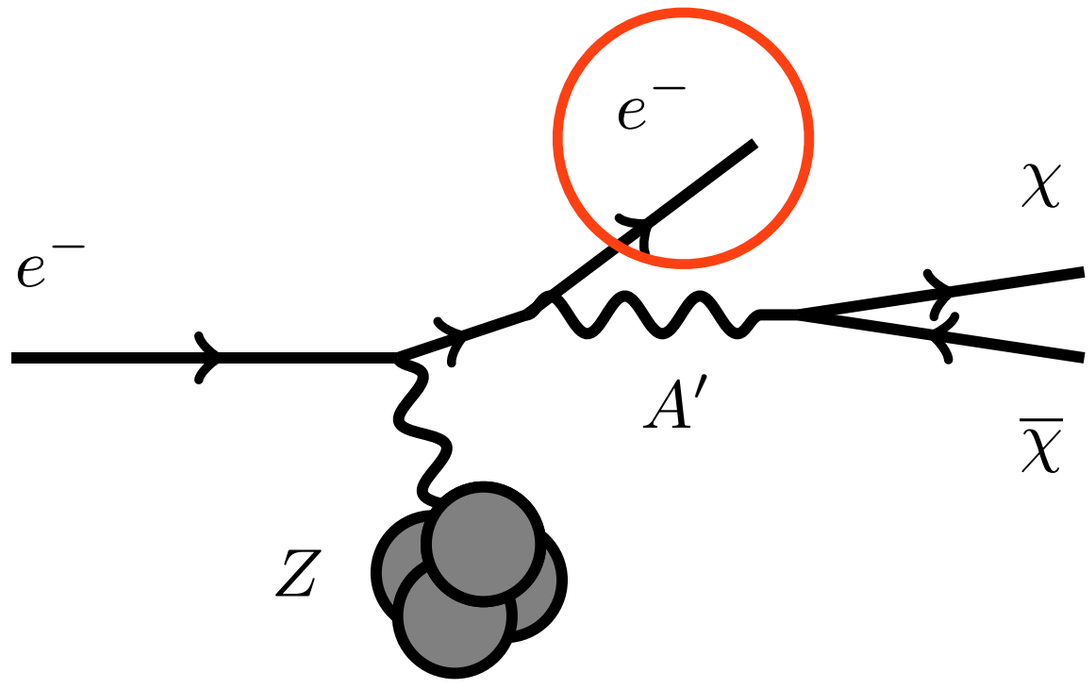
Closeout Session

Dark Sectors Workshop SLAC, April 30, 2016

LDM @ Accelerators

Technique #1

Inferred DM observation

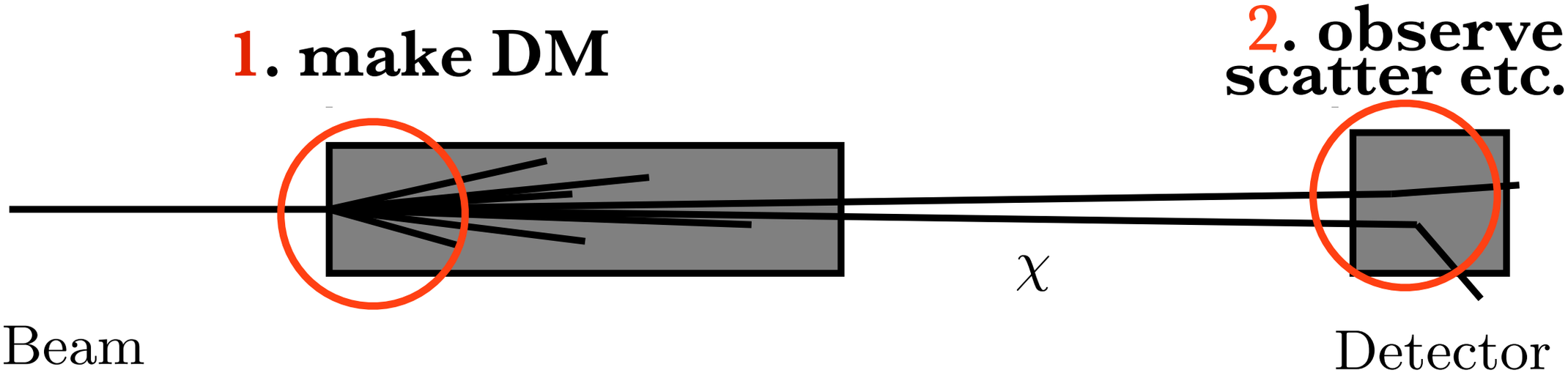


Detection based on other objects

Can be production in proton or electron fixed target or collider

LDM @ Accelerators
Technique #2

Production + Direct measurement



Two-step detection using LDM itself

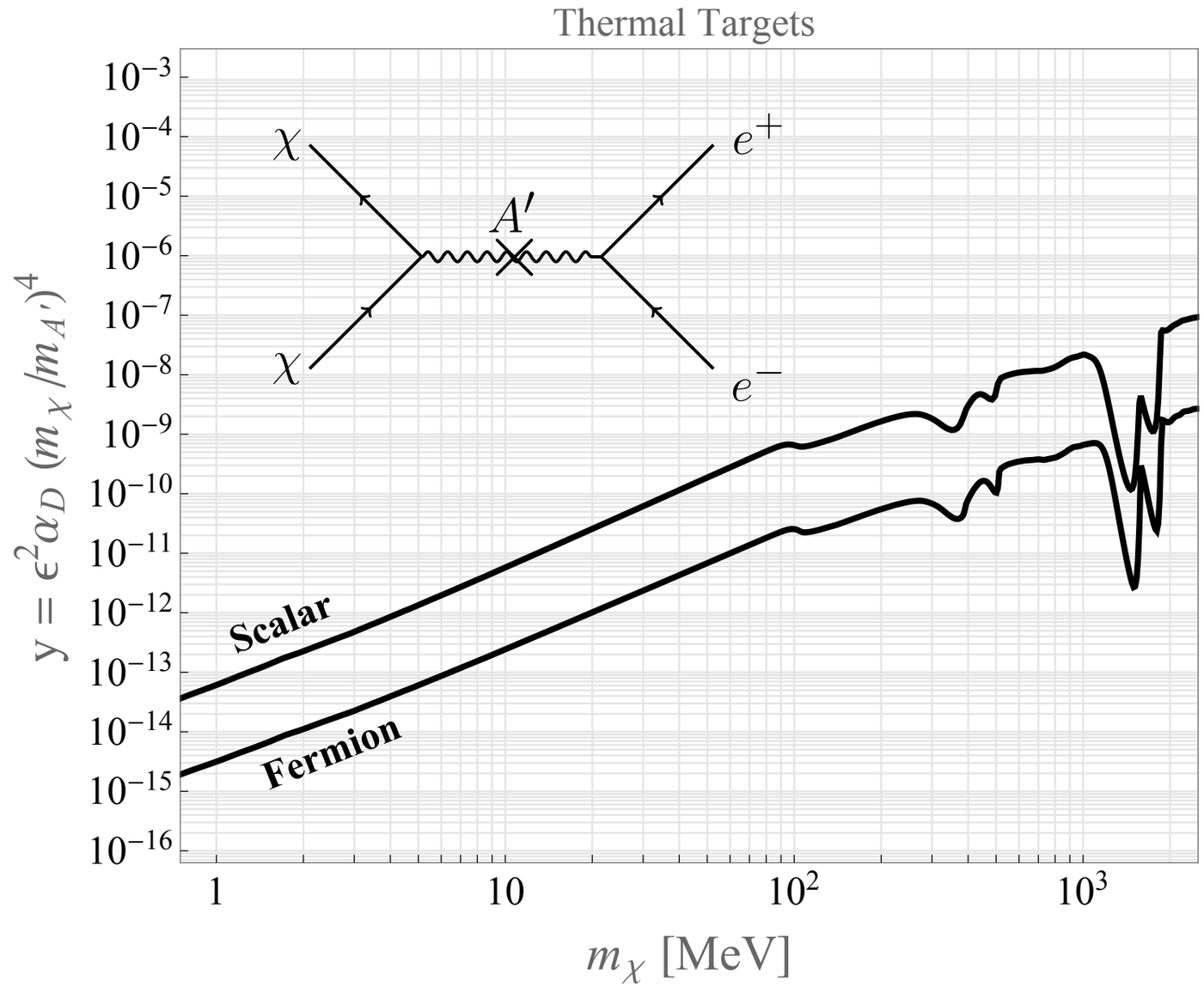
Can be production in proton or electron fixed target or collider

Large DMA Landscape

	Electron beam	Proton beam
Detect	SLAC BDX JLAB BDX, Mainz MAMI/MESA, Cornell?	FNAL (SeaQuest, μB, LBNF, DUNE, μUD?), Daedalus, T2K, Minos, NovA, SNS, SHiP?
Infer	Cornell, Frascati, Padme, VEPP3, DarkLight, JLAB, LDMX, NA64, BaBar, Belle II, LEP	LHC, Tevatron, NA62, SHiP, SeaQuest?

LDM @ Accelerators

Physically motivated targets... others?

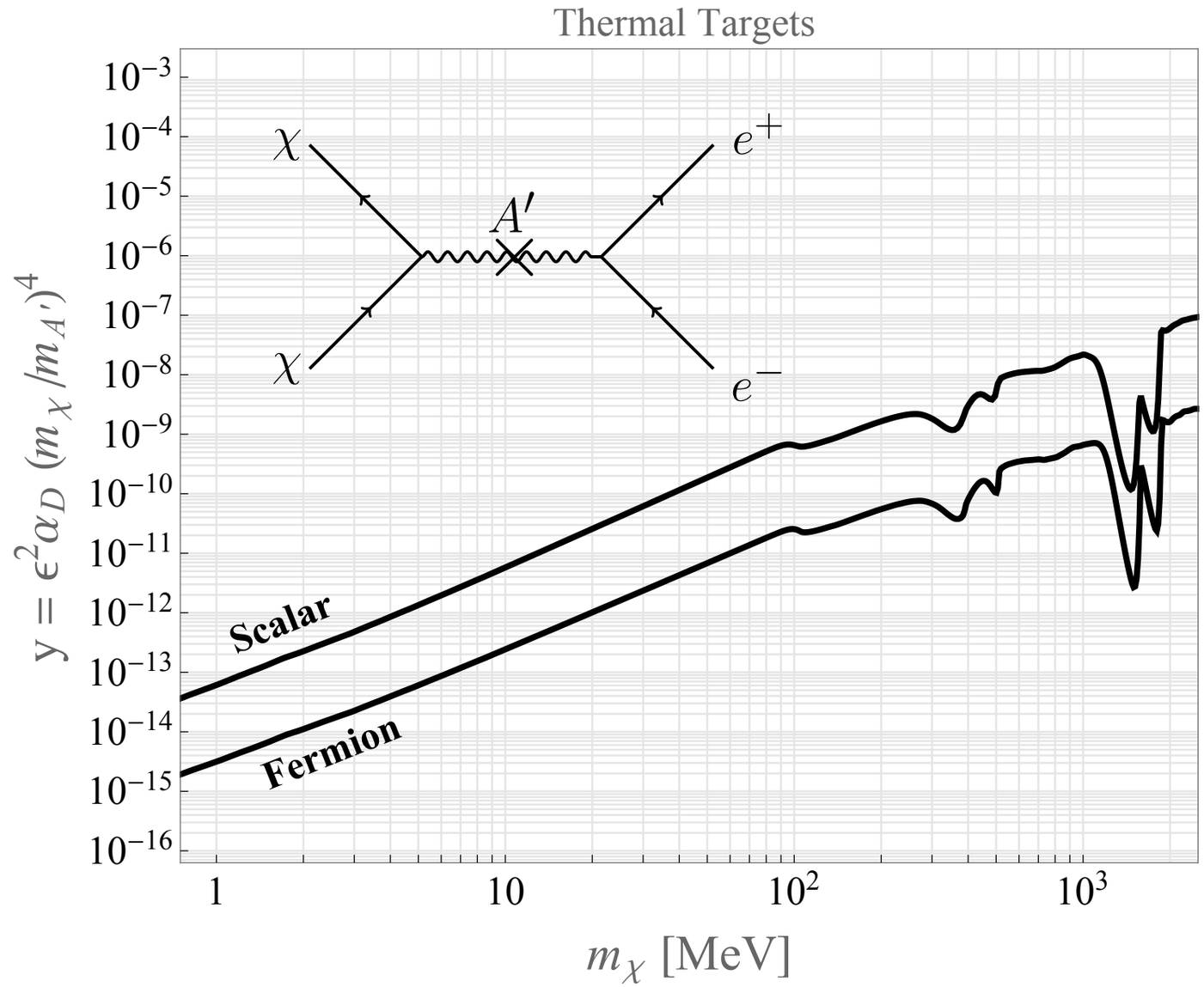


$$y \equiv \epsilon^2 \alpha_D \left(\frac{m_\chi}{m_{A'}} \right)^4$$

LDM @ Accelerators

Physically motivated targets... others?

$$\times m_\chi^2 \times \frac{1}{m_\chi^2}$$

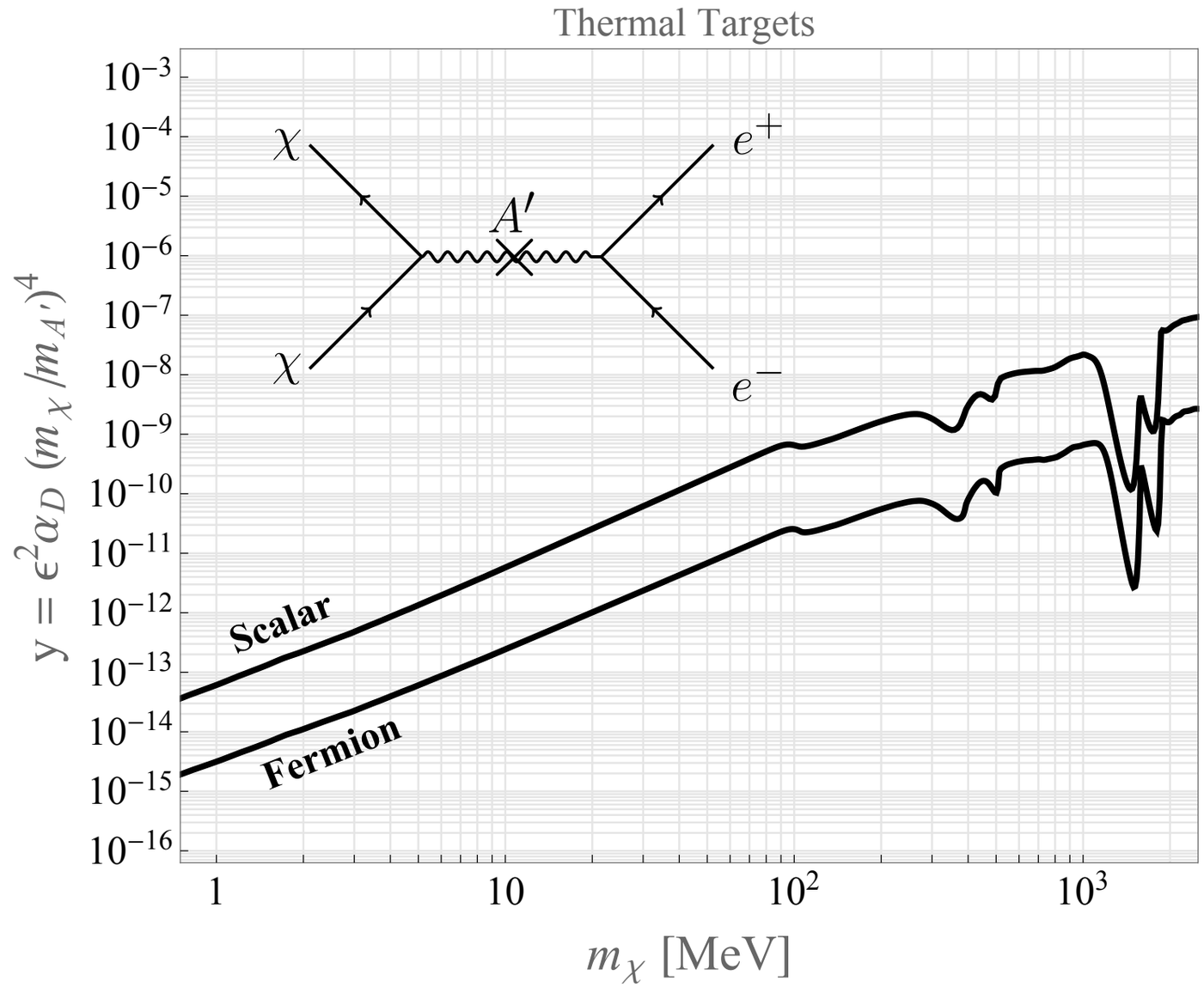


$$y \equiv \epsilon^2 \alpha_D \left(\frac{m_\chi}{m_{A'}} \right)^4$$

LDM @ Accelerators

Physically motivated targets... others?

$$\sigma v \sim \alpha_D \epsilon^2 \alpha \times \frac{m_\chi^2}{m_{A'}^4} \times m_\chi^2 \times \frac{1}{m_\chi^2}$$

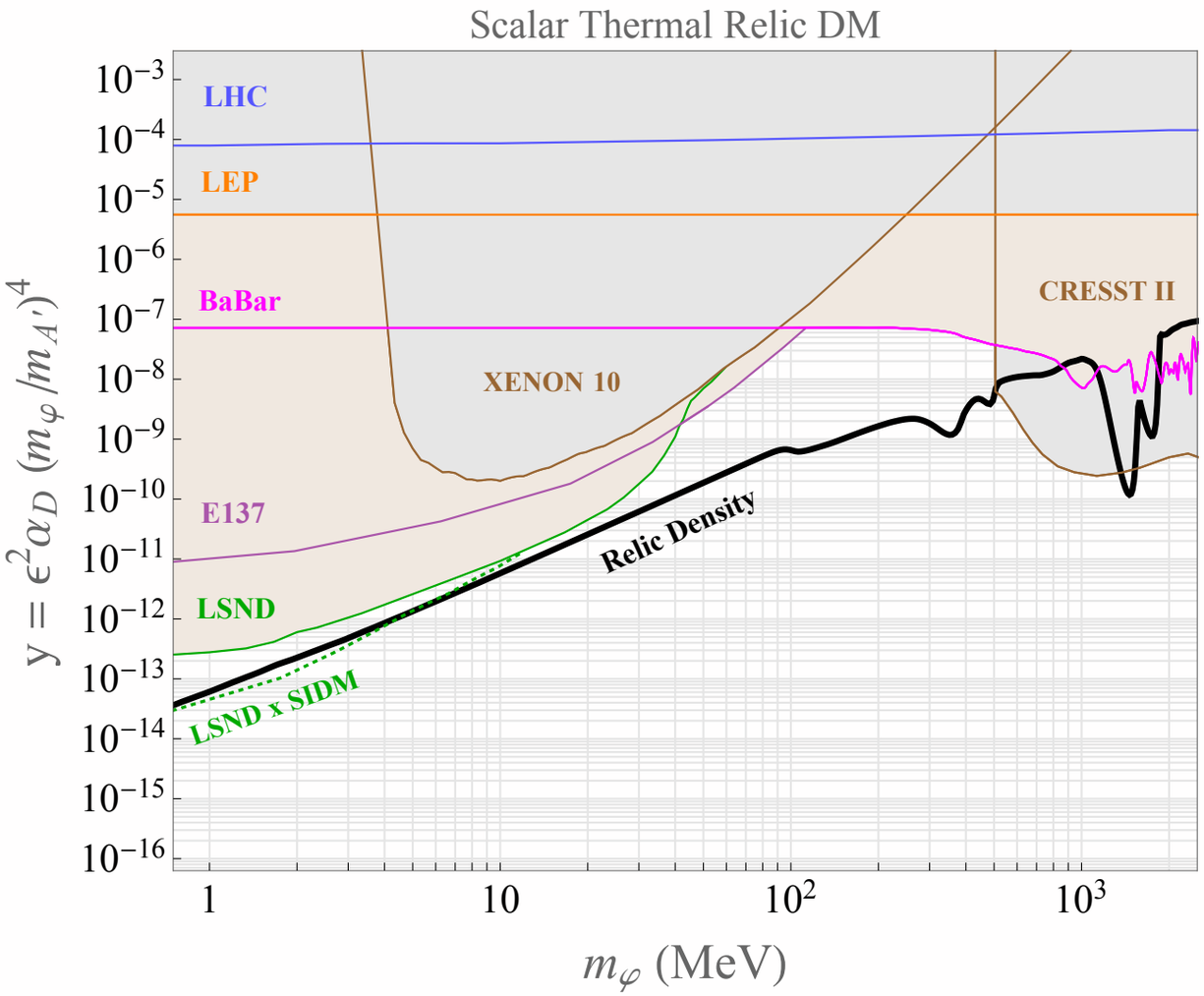


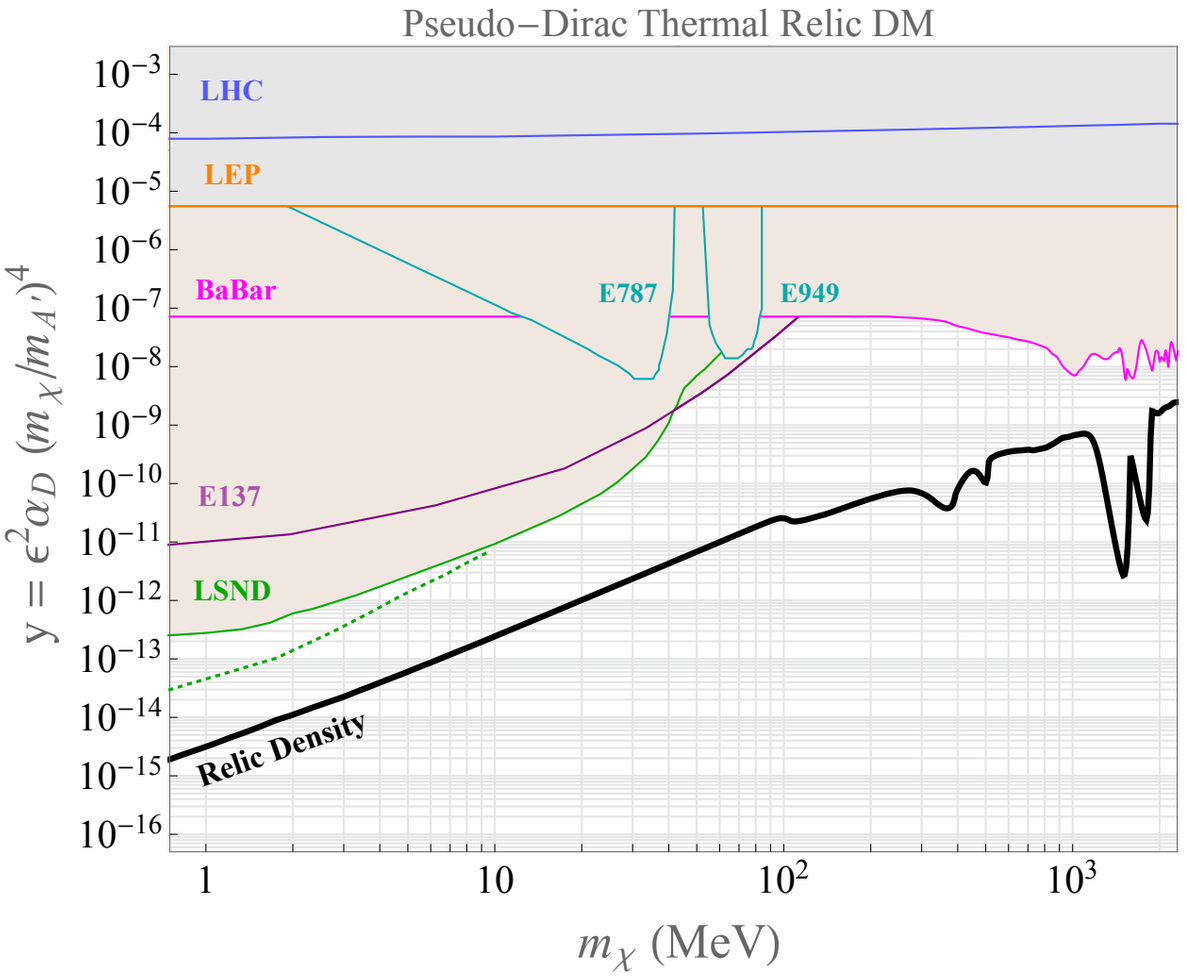
$$y \equiv \epsilon^2 \alpha_D \left(\frac{m_\chi}{m_{A'}} \right)^4$$

Dimensionless rate parameter

LDM @ Accelerators

Physically motivated targets... others?





Dark photon invisibly decaying to LDM

LDM @ Accelerators

Moving a large new field forward

Thus far, emphasis on "parasitic/symbiotic" experiments

Is this reasonable given the community size and physics case?

DMA community ready for dedicated experiments to decisively probe much of LDM

Strong DM priority in Snowmass, P5

Many next generation experiments will be dedicated