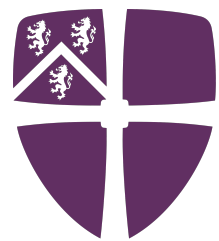

Dark Matter Beyond the WIMP



Durham
University

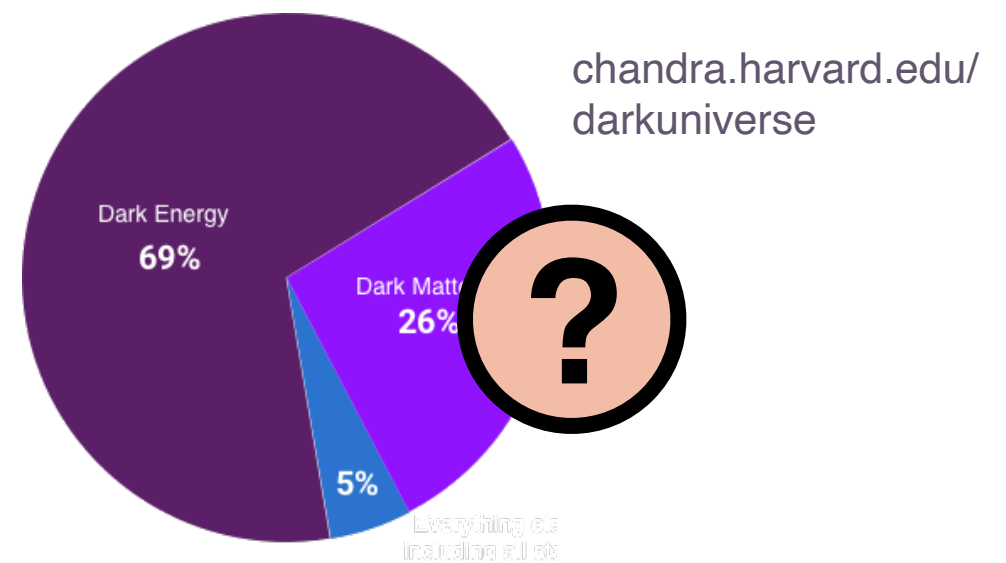


Rachel Houtz
IPPP
Durham University

YETI 2022: Phenomenology in the Sky

Dark Matter Evidence

- ❖ Significant evidence for a new particle beyond the SM



Galaxy rotation curves



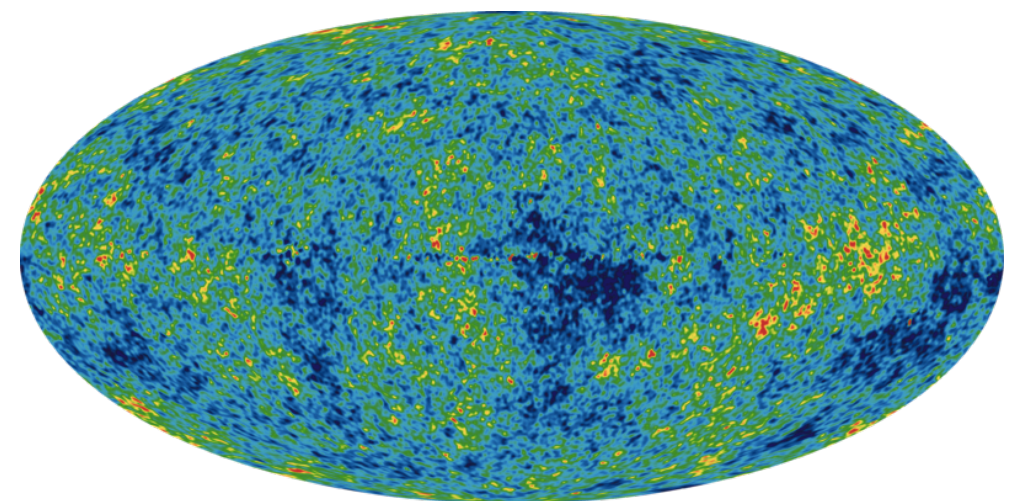
ESA/Hubble

Gravitational lensing



nasa.gov
Markevitch et al., Clowe et al.

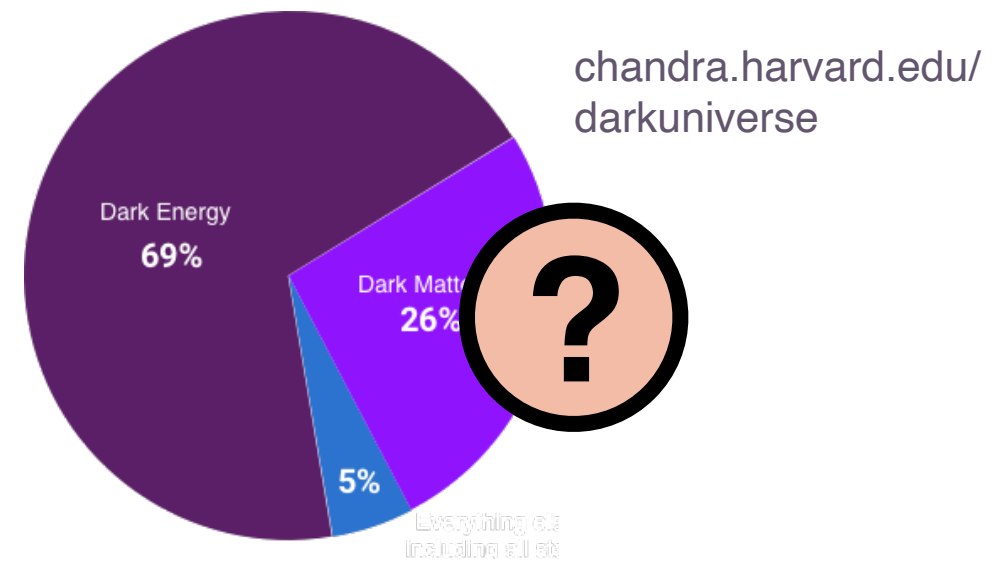
Cosmic Microwave Background



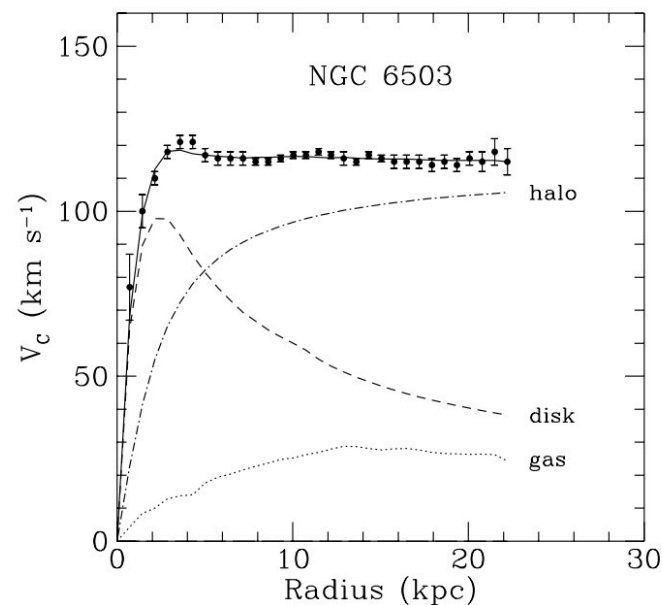
wmap.gsfc.nasa.gov

Dark Matter Evidence

- ❖ Significant evidence for a new particle beyond the SM



Galaxy rotation curves



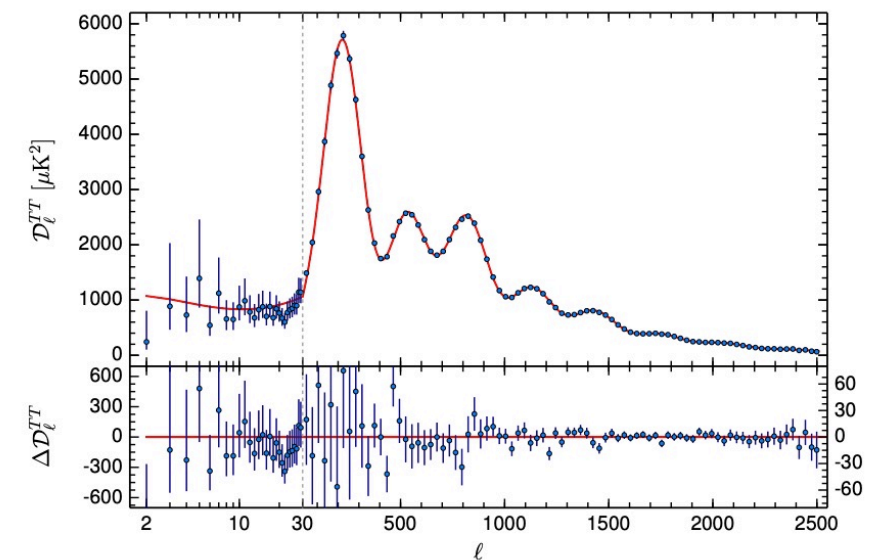
Begeman, Broeils, Sanders (1991)

Gravitational lensing



nasa.gov
Markevitch et al., Clowe et al.

Cosmic Microwave Background



Planck Collaboration, arXiv:1502.01589

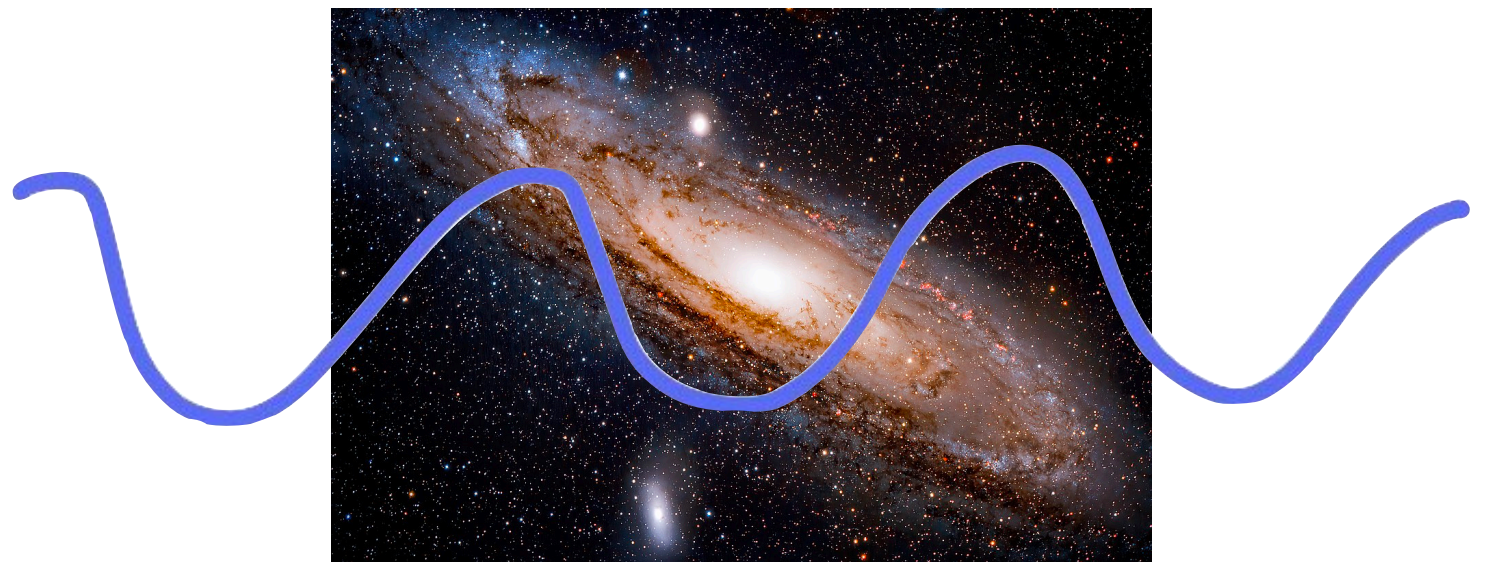
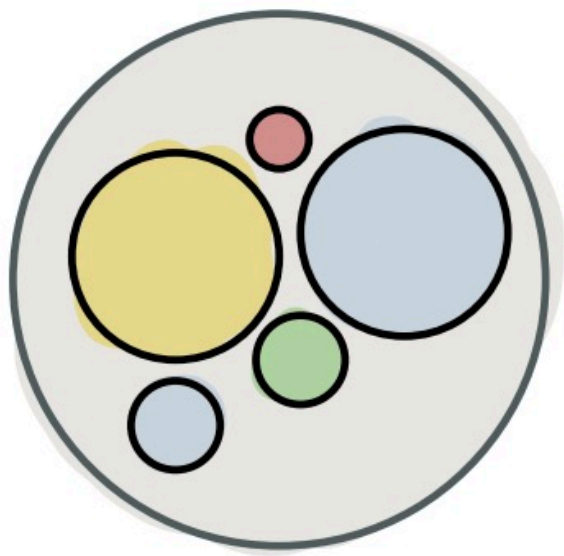


?

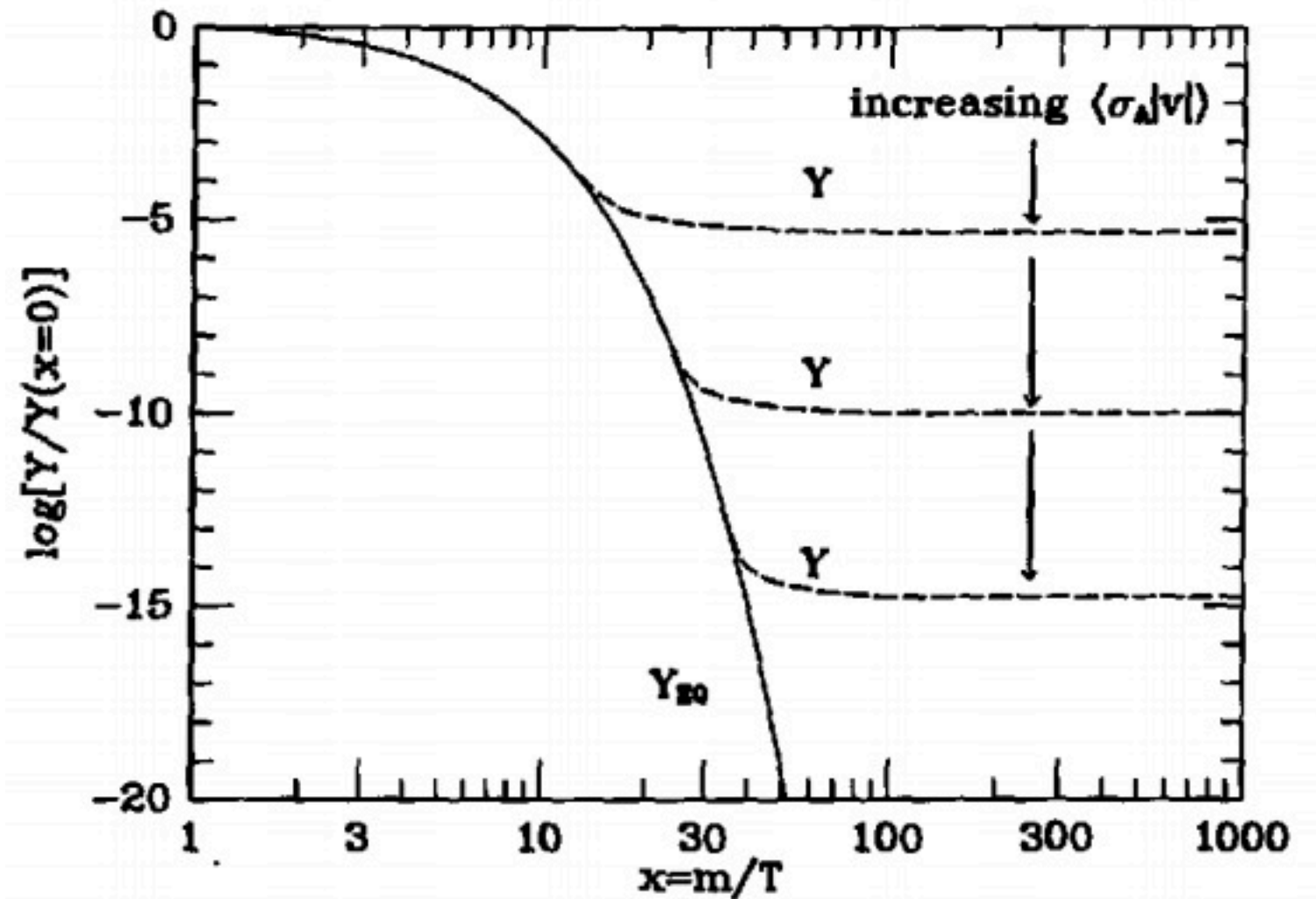
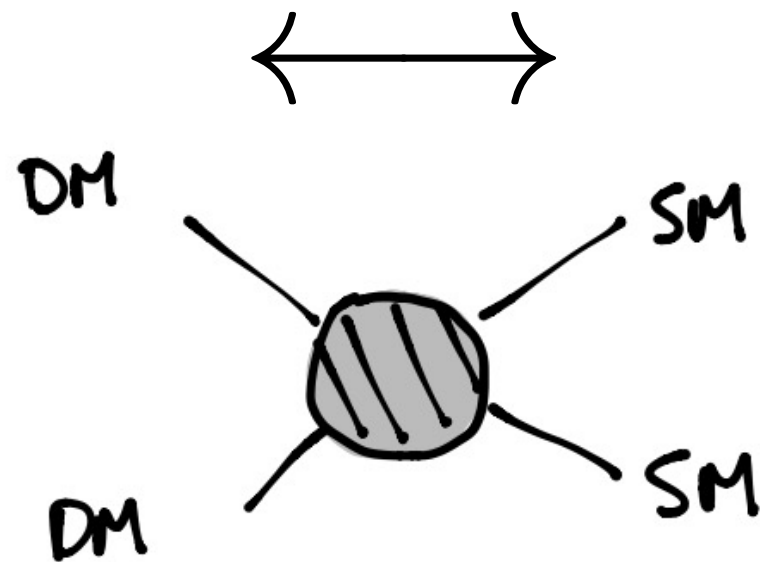


?

Dark Matter Mass Scales

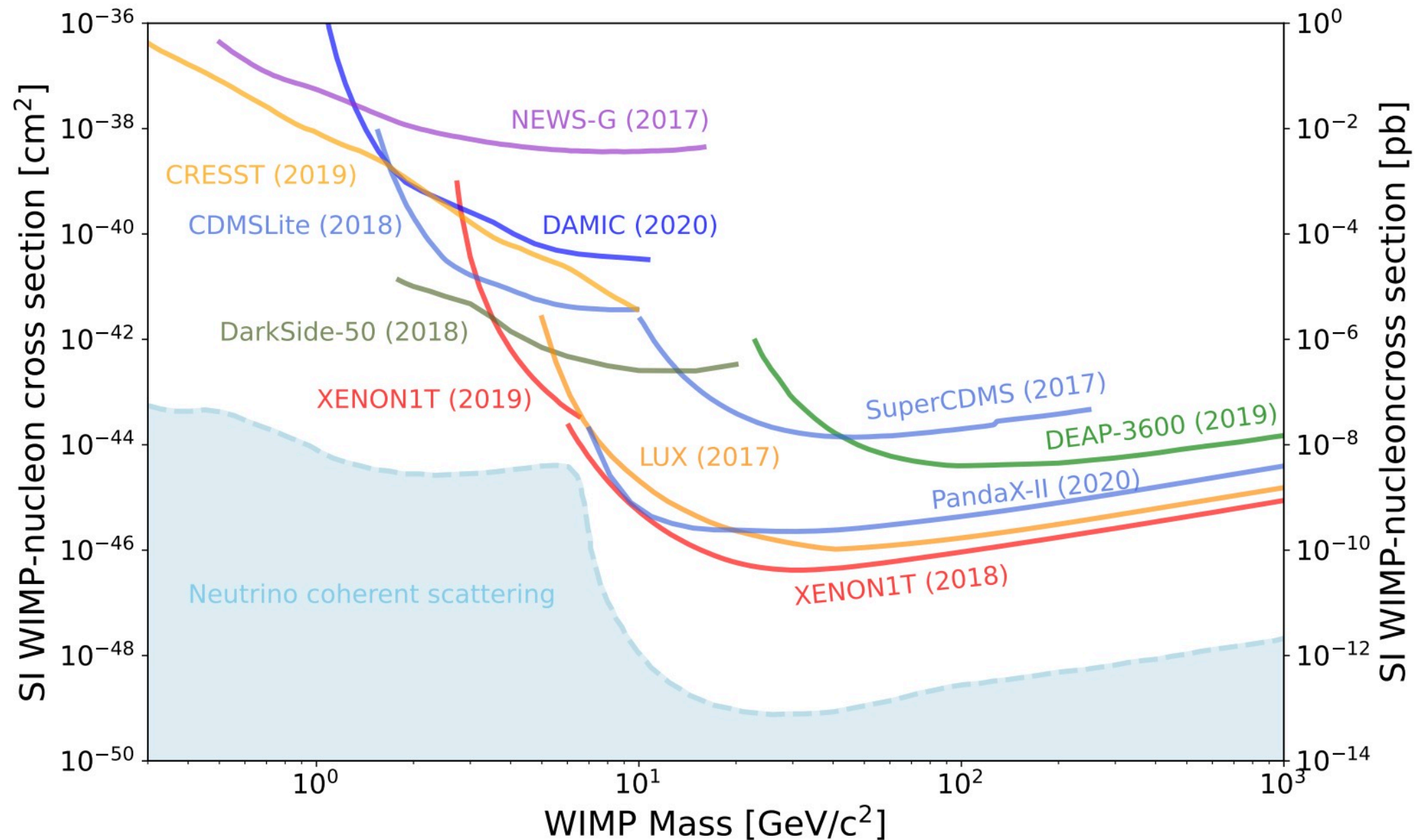


WIMP Dark Matter



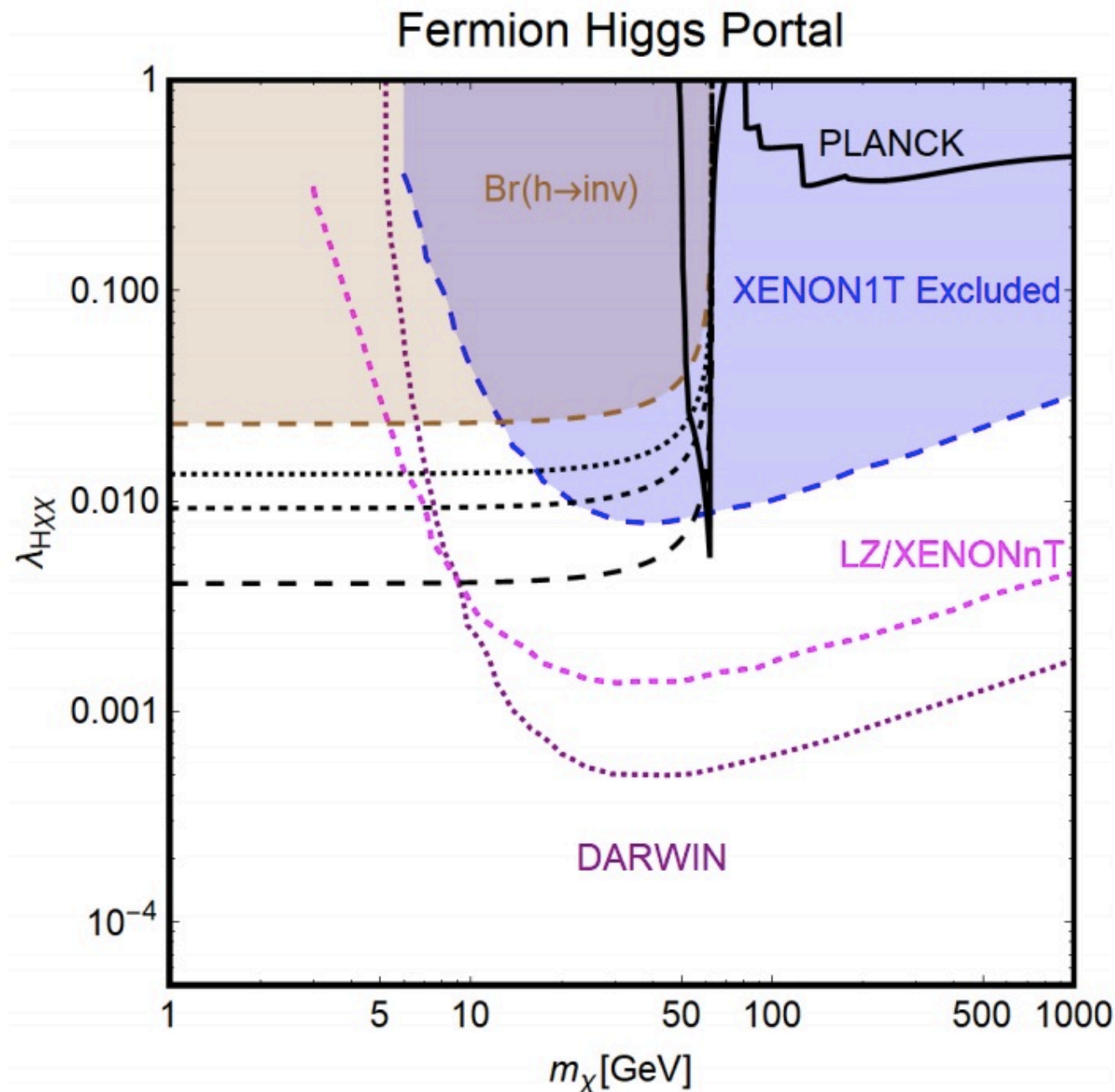
Plot lifted from Kolb & Turner

WIMP Dark Matter



Baudis, Profumo, Particle Data Group (2022)

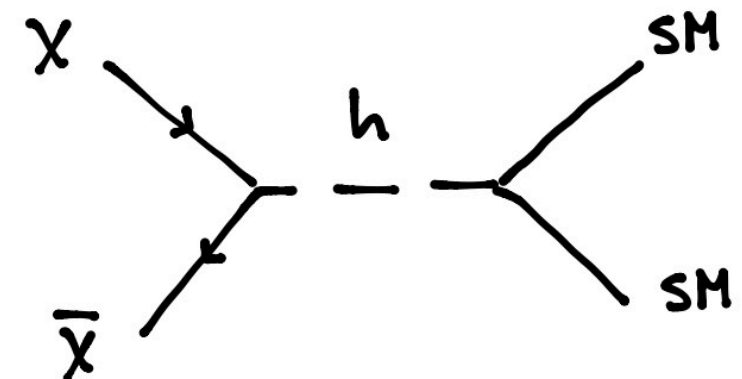
The Higgs Portal WIMP



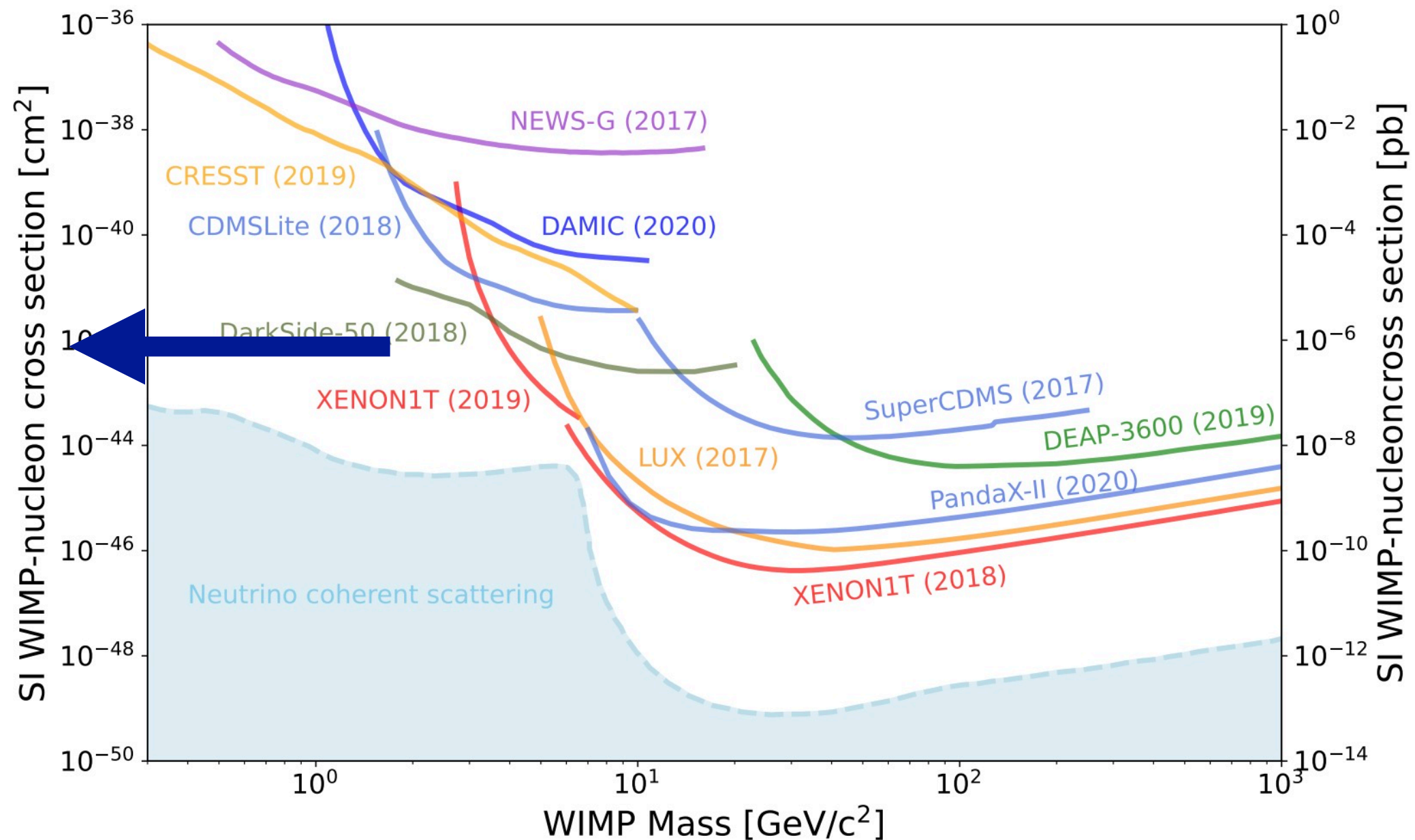
Plot lifted from Arcadi, Djouadi, Raidal, arXiv:1903.03616

- ❖ The Higgs portal is only open right on the resonance

$$2m_\chi \approx m_h$$

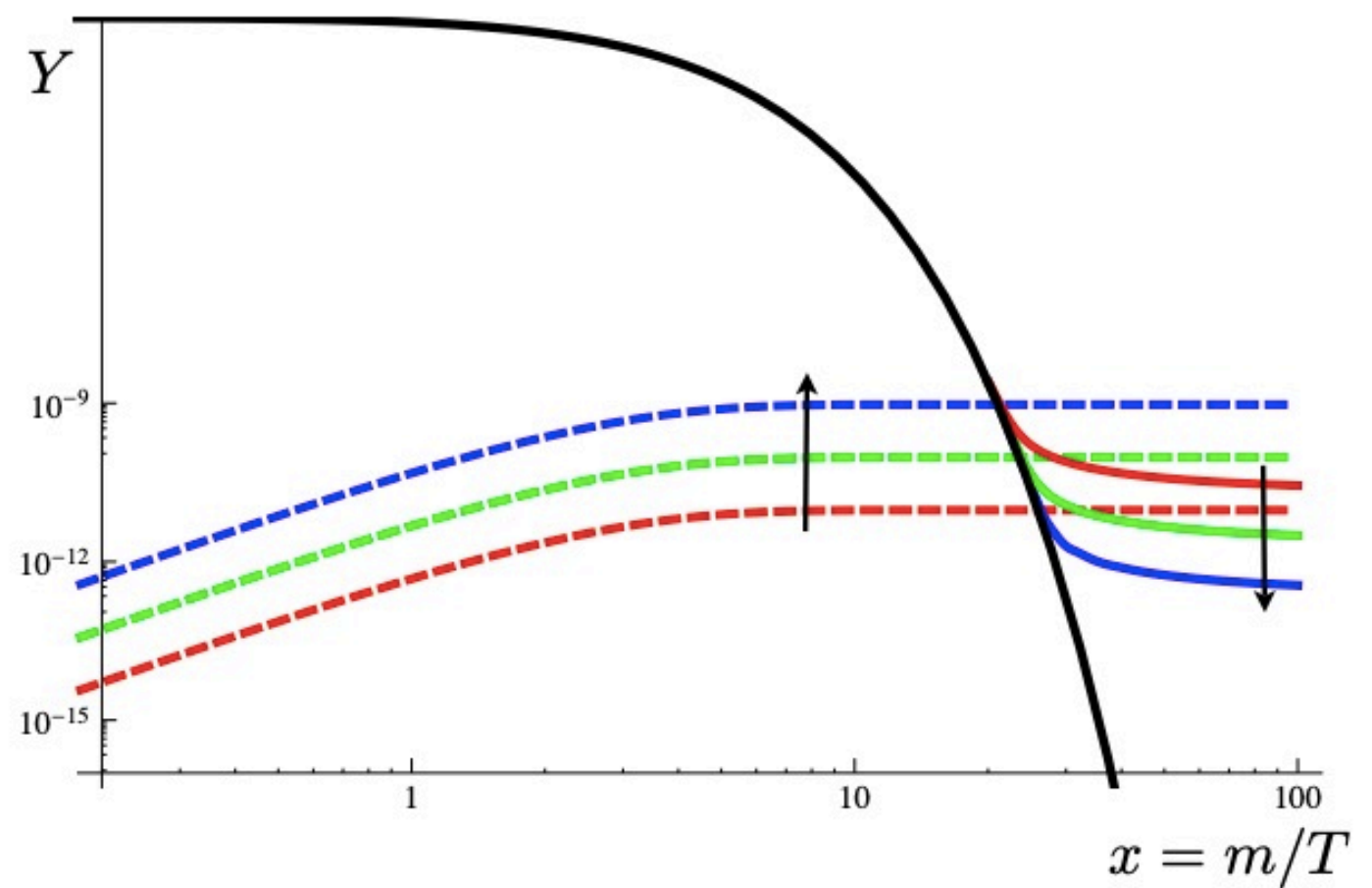
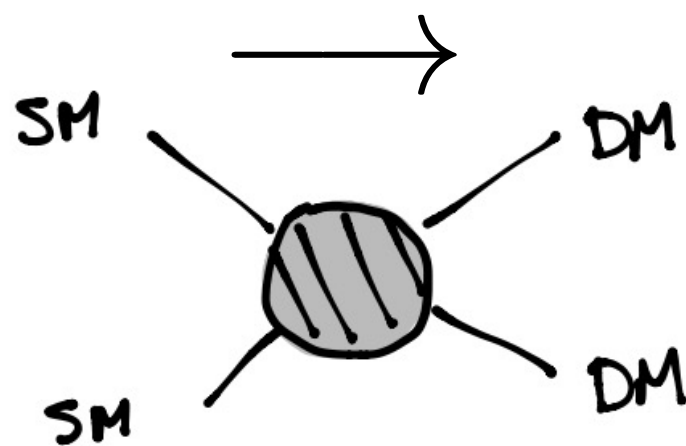


WIMP Dark Matter



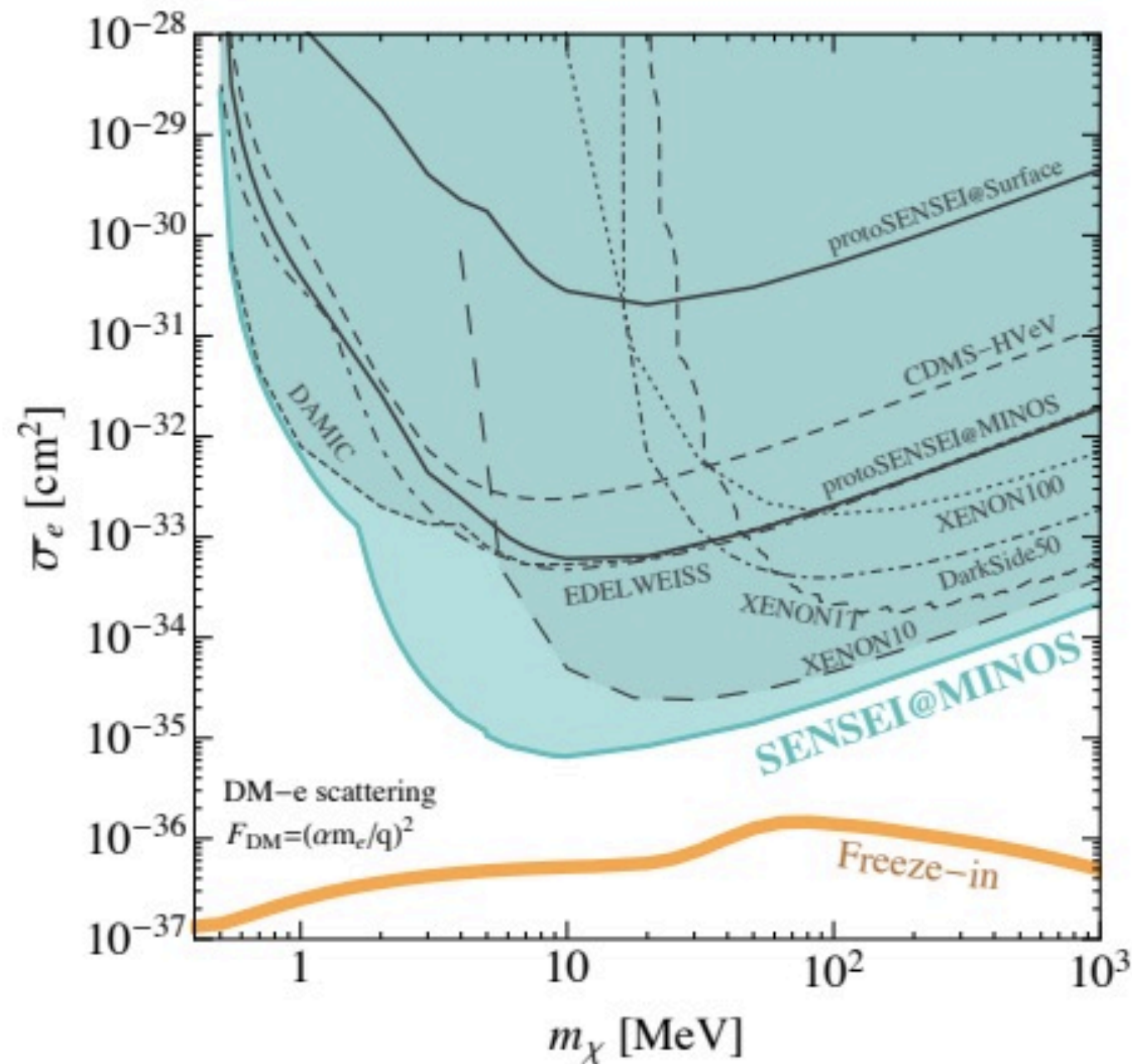
Baudis, Profumo, Particle Data Group (2020)

Freeze-in Dark Matter



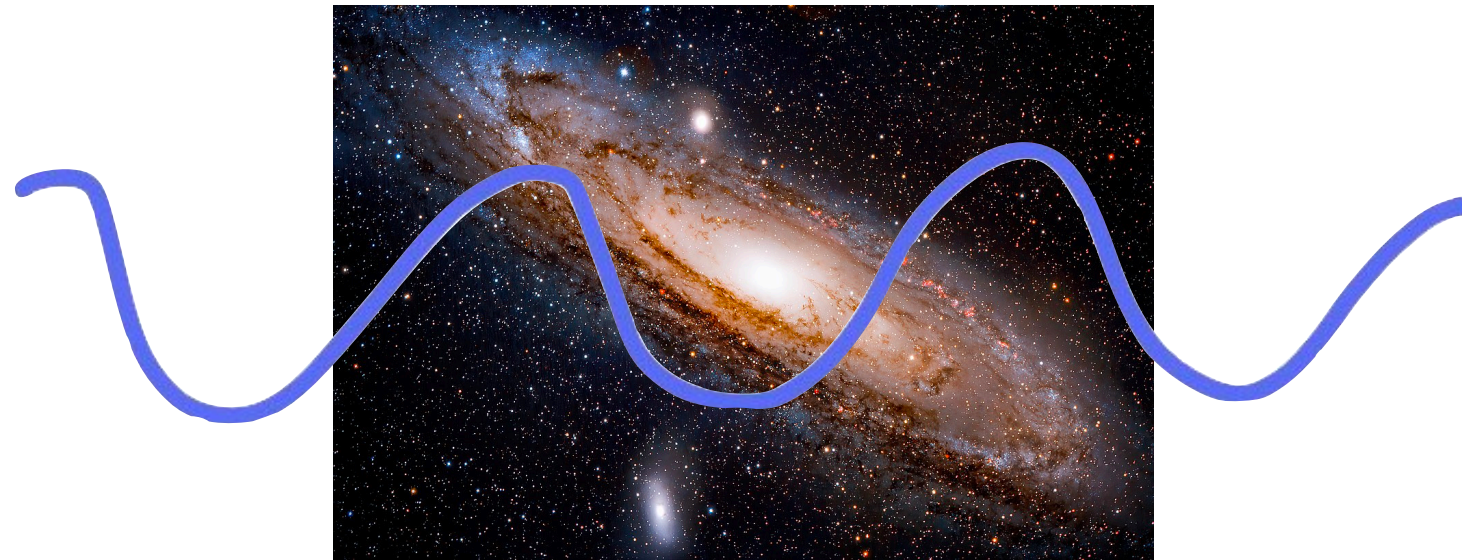
Hall, Jedamzik, March-Russell, West, arXiv:0911.1120
McDonald, hep-ph/0106249

Direct Detection of Sub-GeV DM

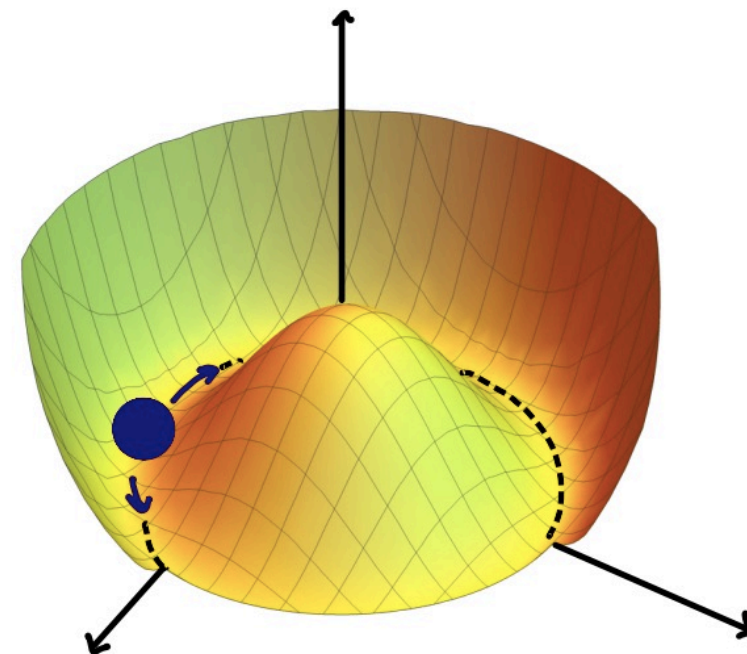
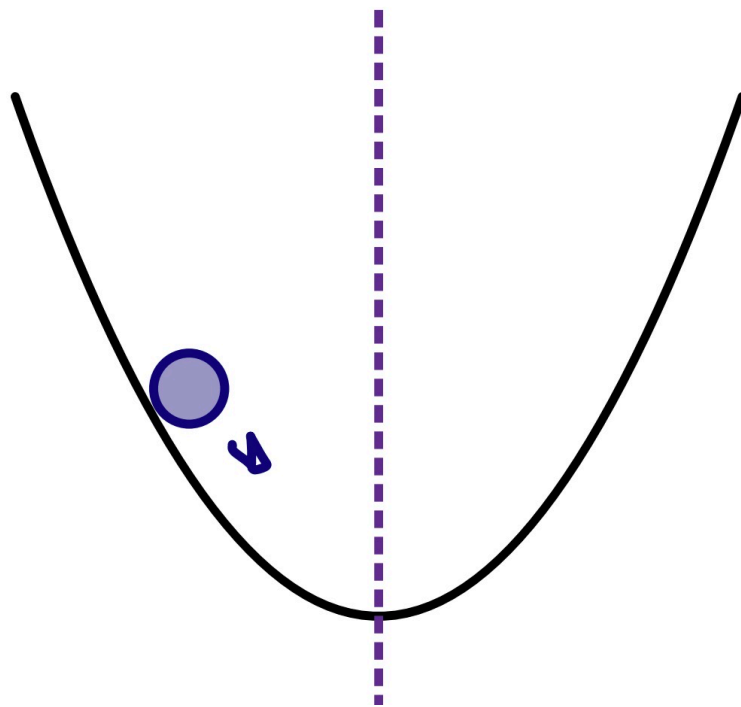


Essig, Mardon, Volansky,
arXiv:1108.5383

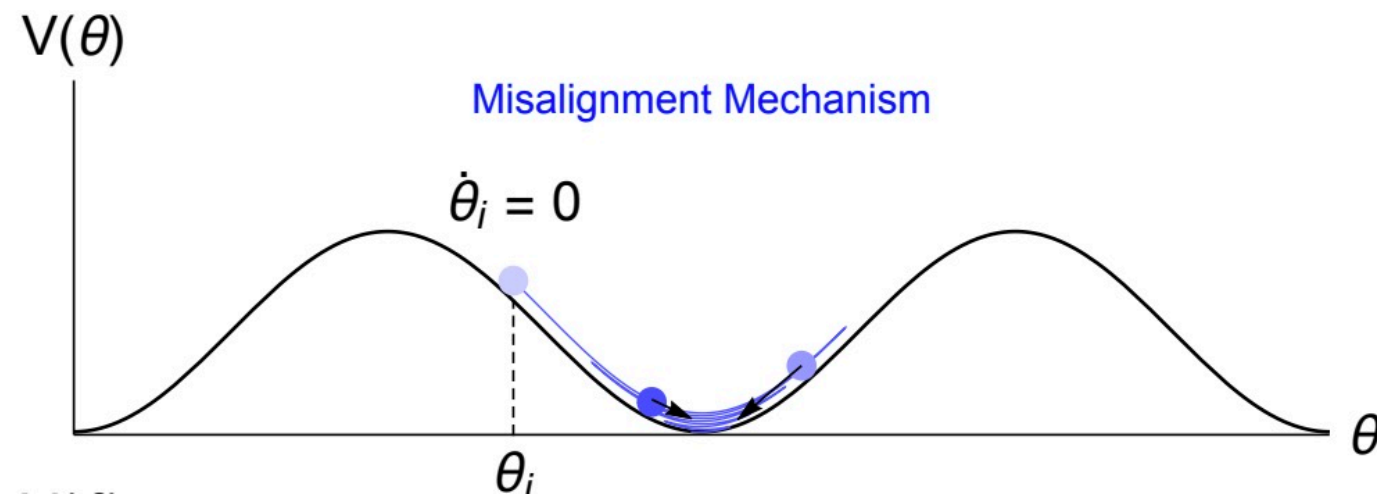
Plot lifted from SENSEI Collaboration, arXiv:2004.11378



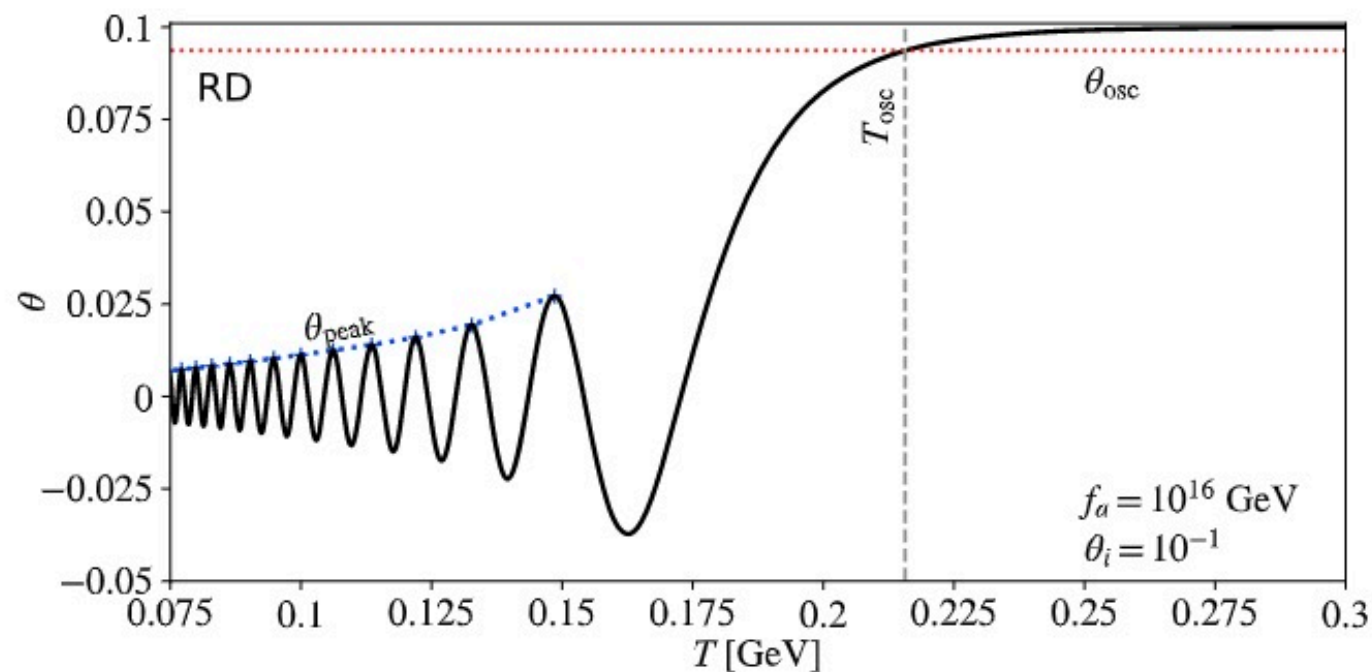
Even Lighter DM: The Misalignment Mechanism



Misalignment Mechanism



Co, Hall, Harigaya,
arXiv:1910.14152



Karamitros, arXiv:2201.10886

Thank you!