Dark Matter Physics from the CMB-S4 Experiment (based on arXiv:2203.07064)

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Dark Matter Physics from the CMB-S4 Experiment

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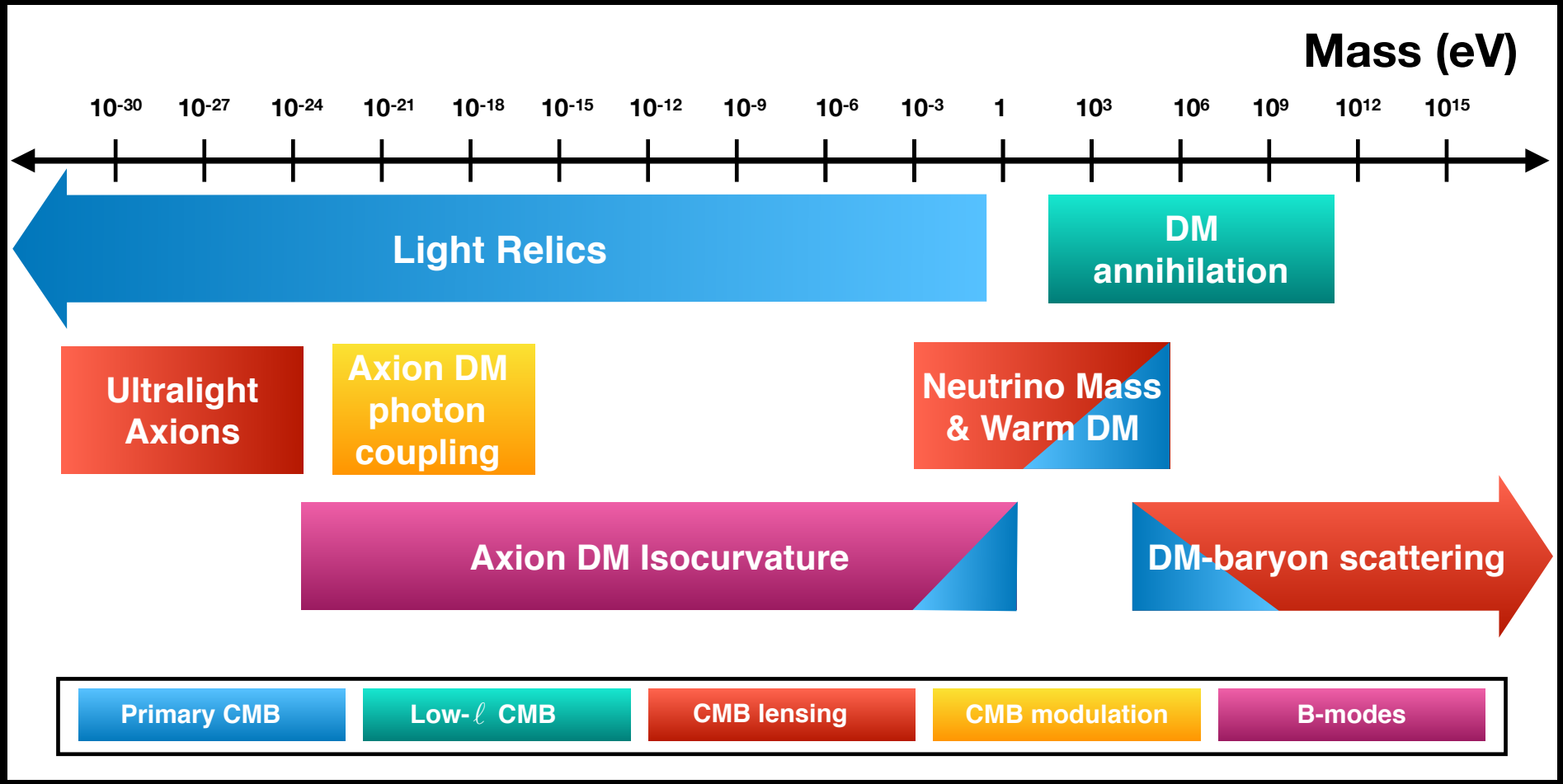
Dark sector



Abazajian et al., (2019)

Ultra-light Axions

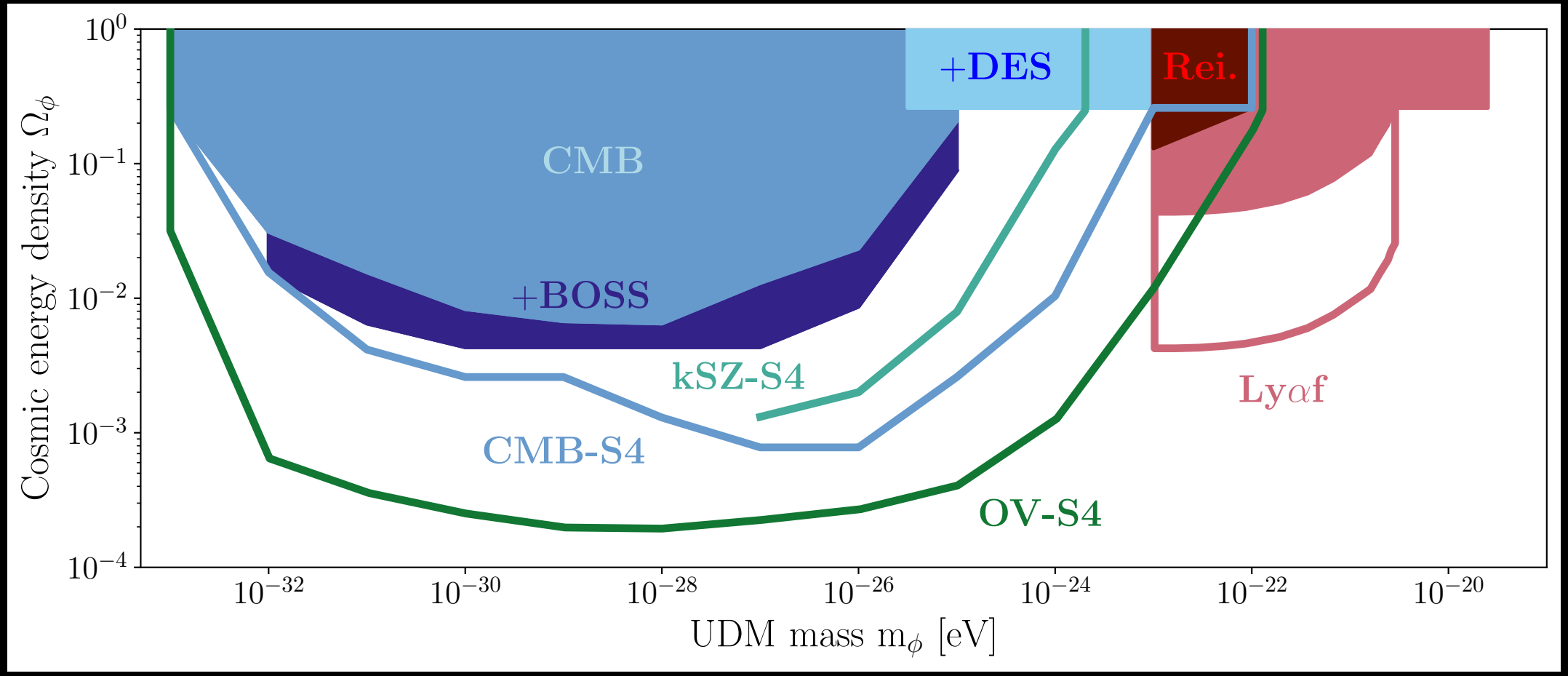
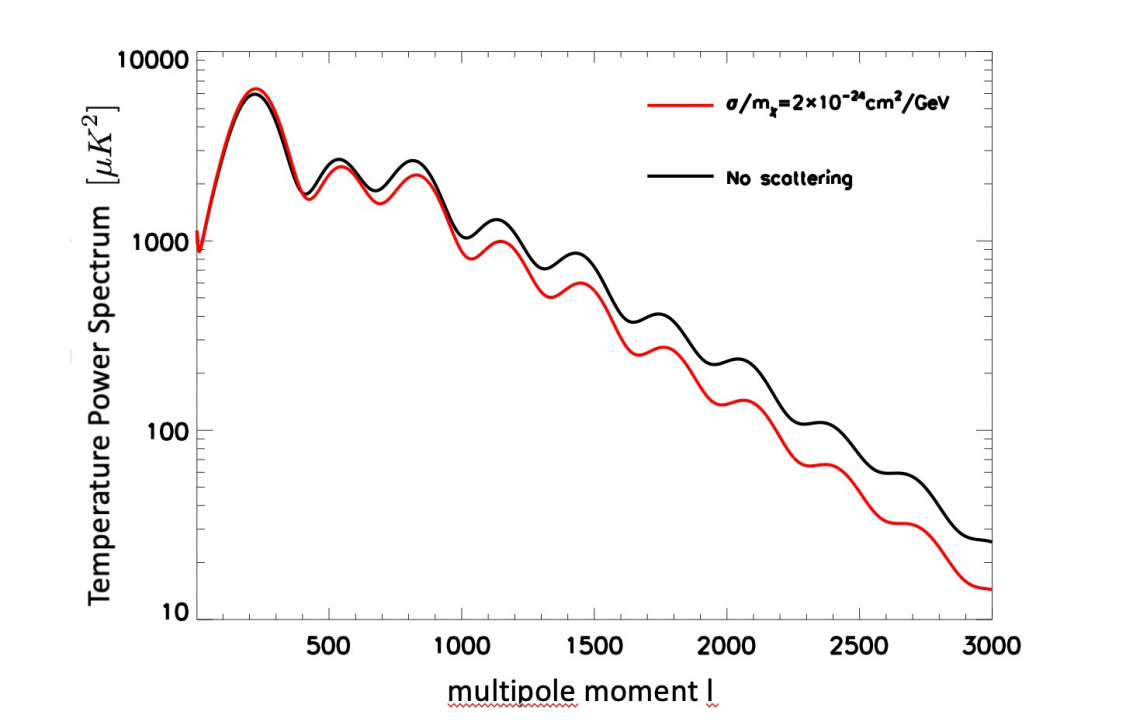
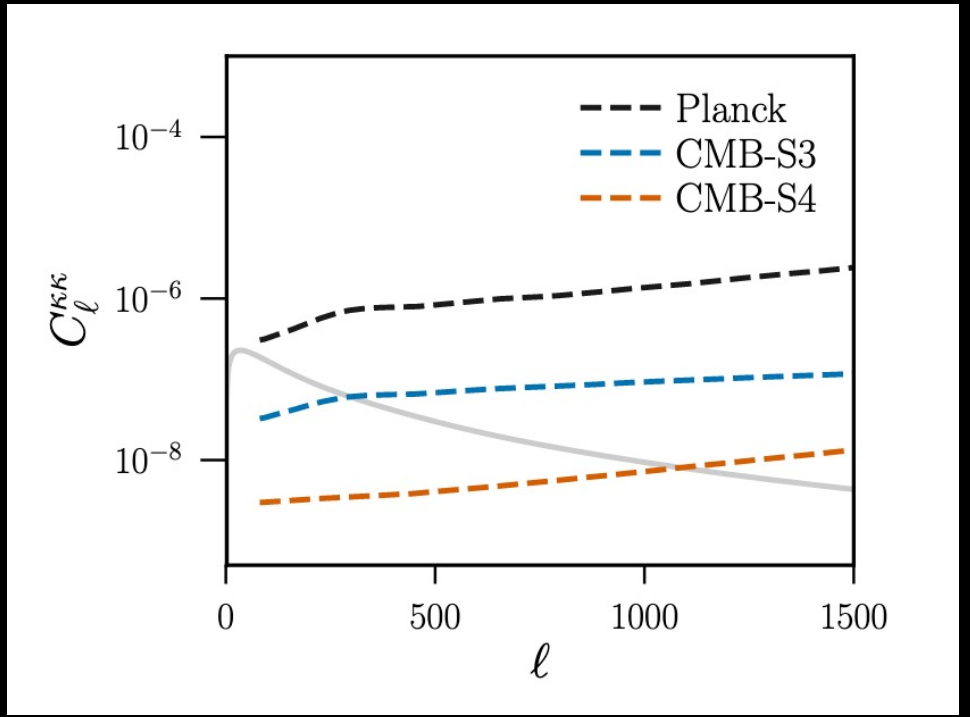


Figure adapted from Farren et al. (2021)

Dark matter-baryon scattering



Dvorkin et al. (2016)



Li et al. (2018)

Dark matter-baryon scattering

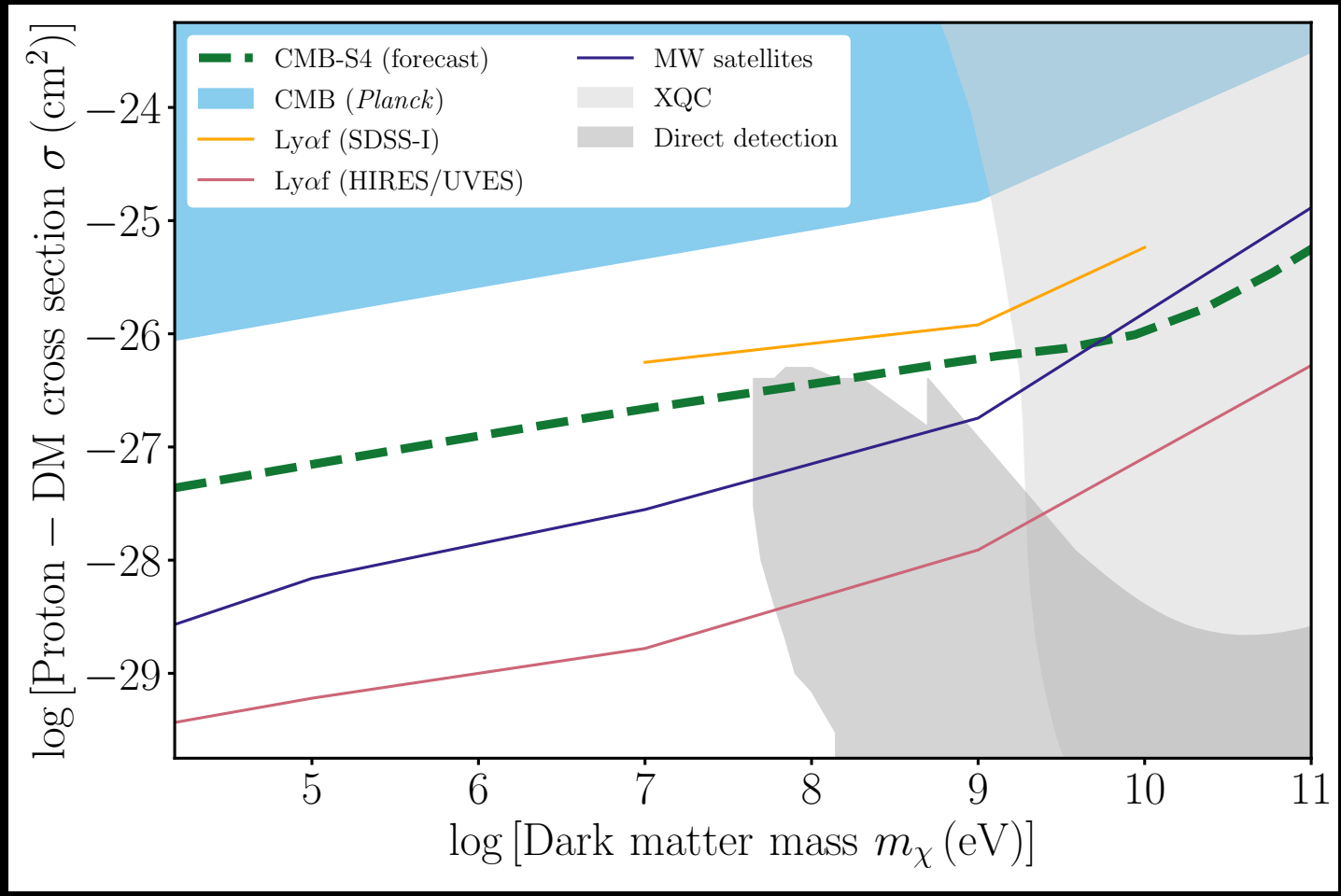
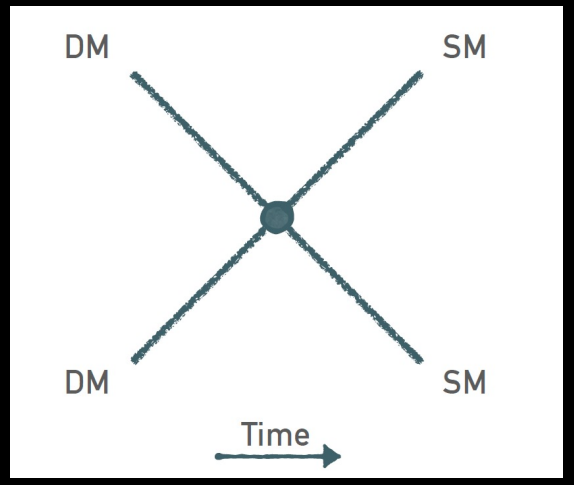
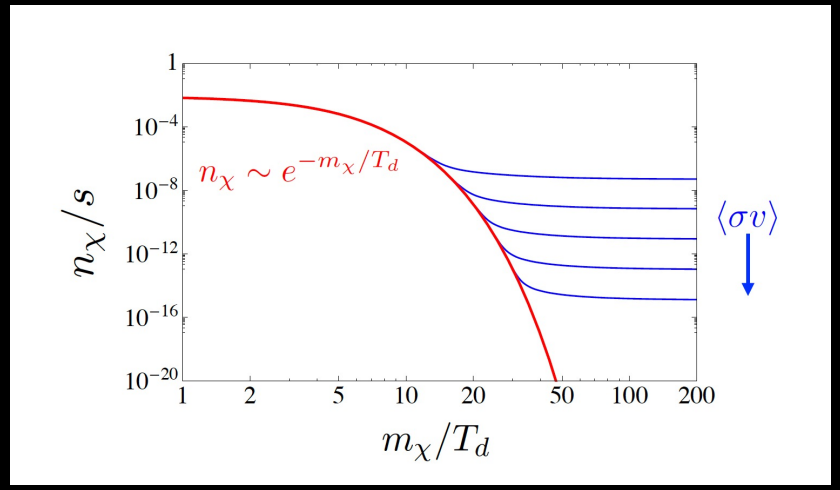


Figure adapted from Rogers, Dvorkin and Peiris (PRL, 2022)

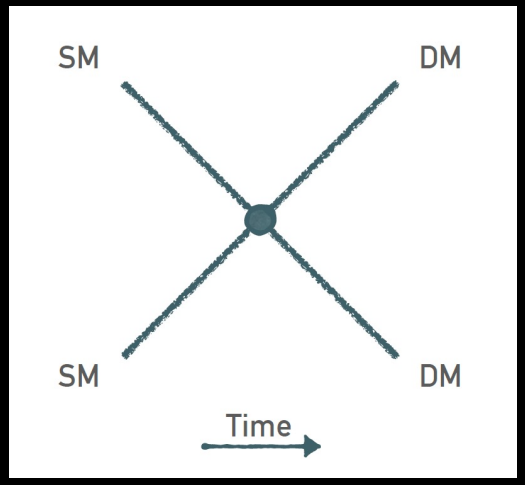
Dark matter freeze-in

Freeze-out

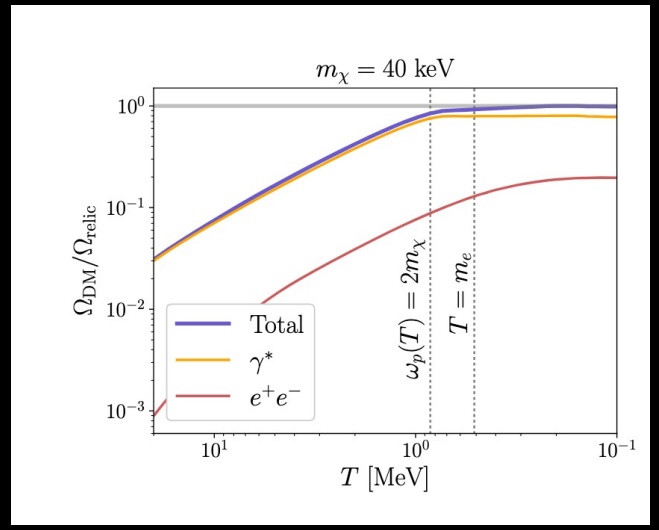




Freeze-in

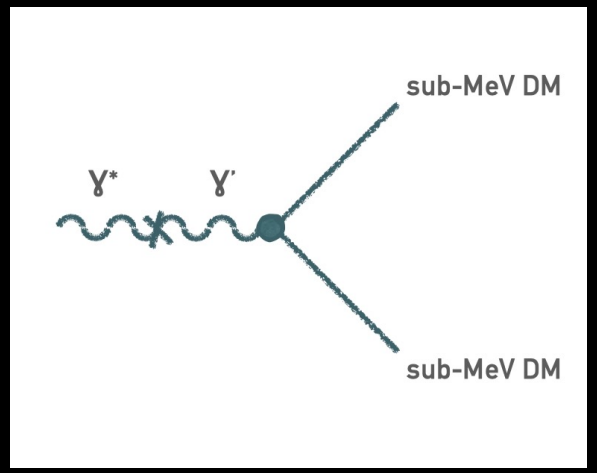


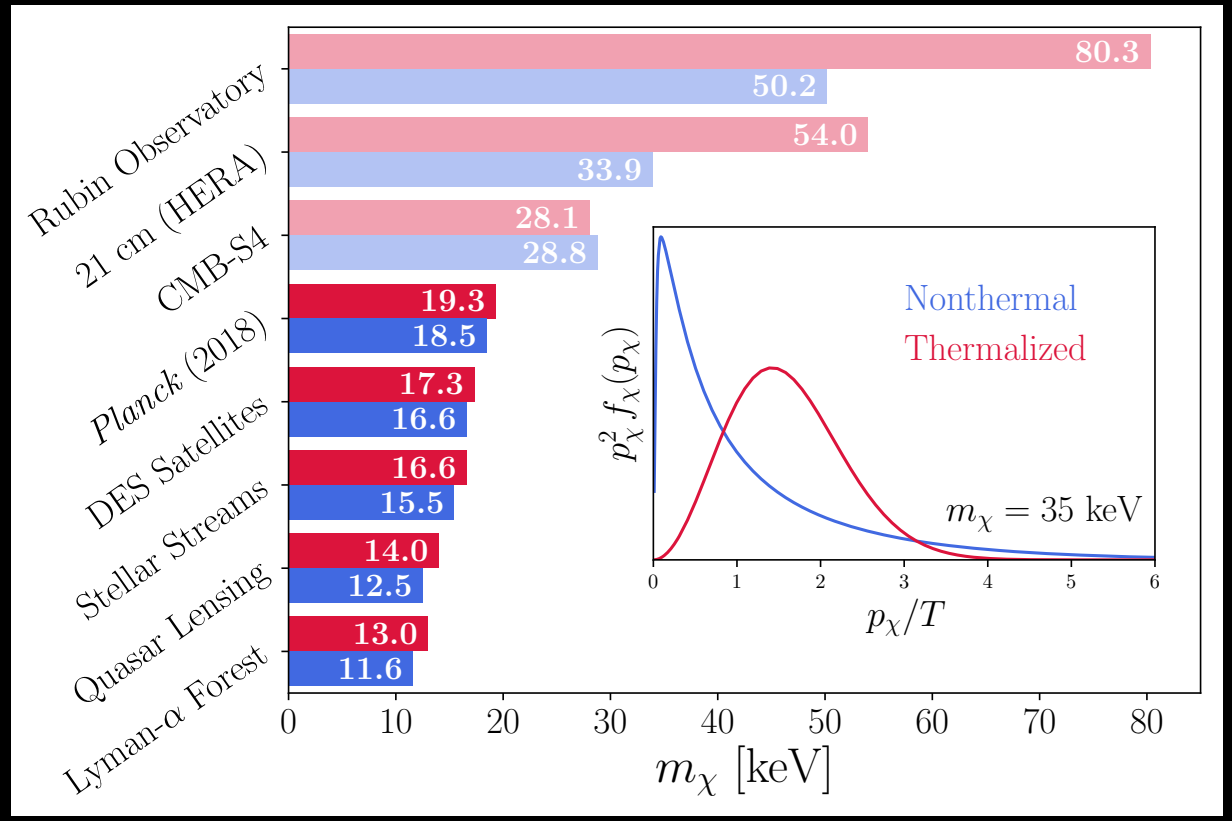
Hall et al. (2009)



Dvorkin, Lin and Schutz (PRD "Editor's Suggestion", 2019)

Dark Matter born out of light

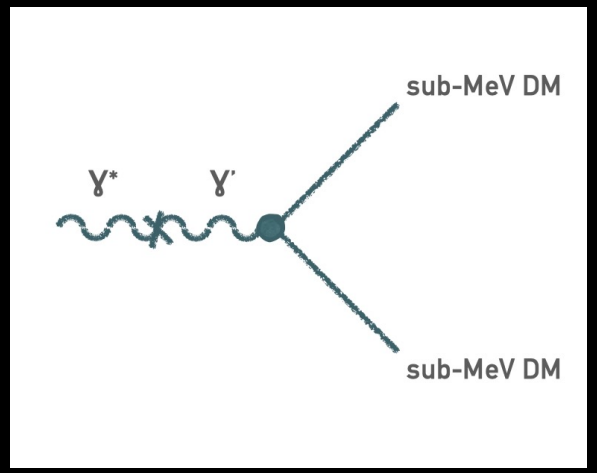


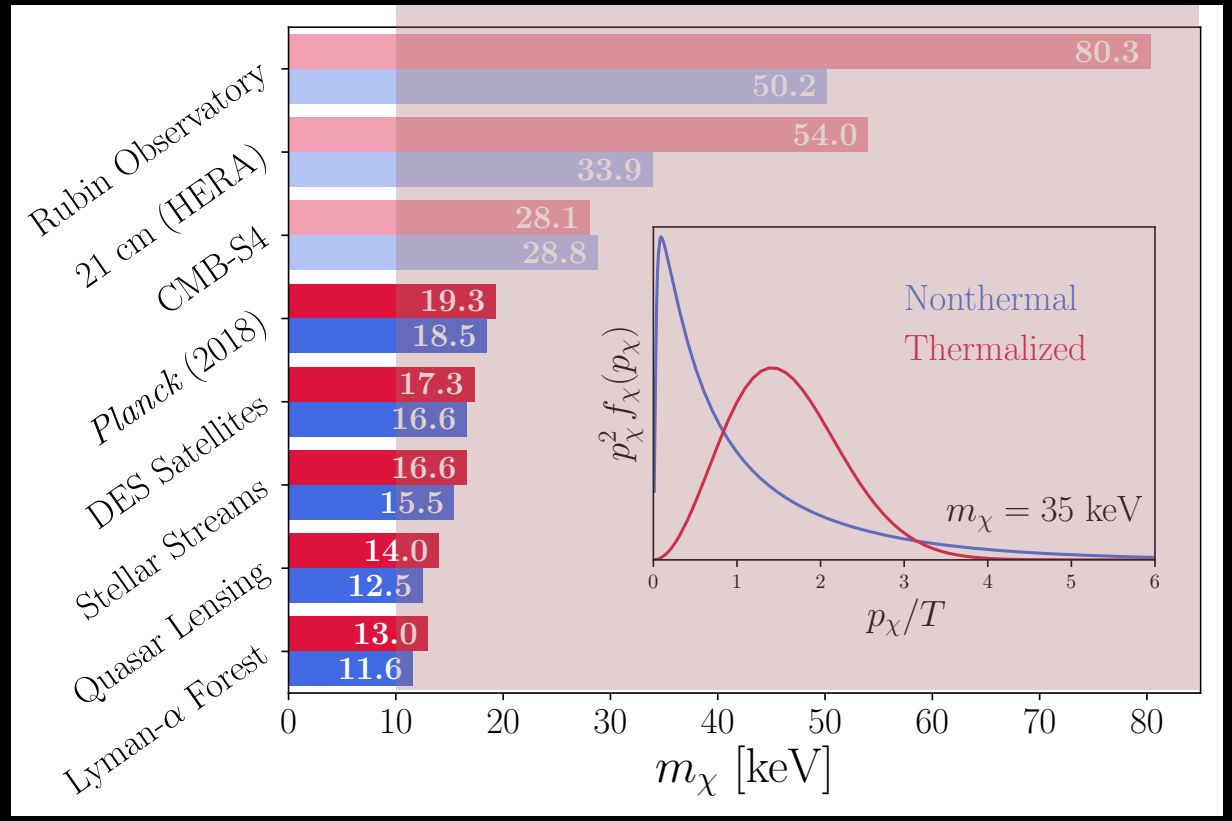


← ruled out

Dvorkin, Lin and Schutz (PRL, 2021)

Complementarity with direct detection searches





ruled out

Dvorkin, Lin and Schutz (PRL, 2021)

Dark Matter-Dark Radiation interactions

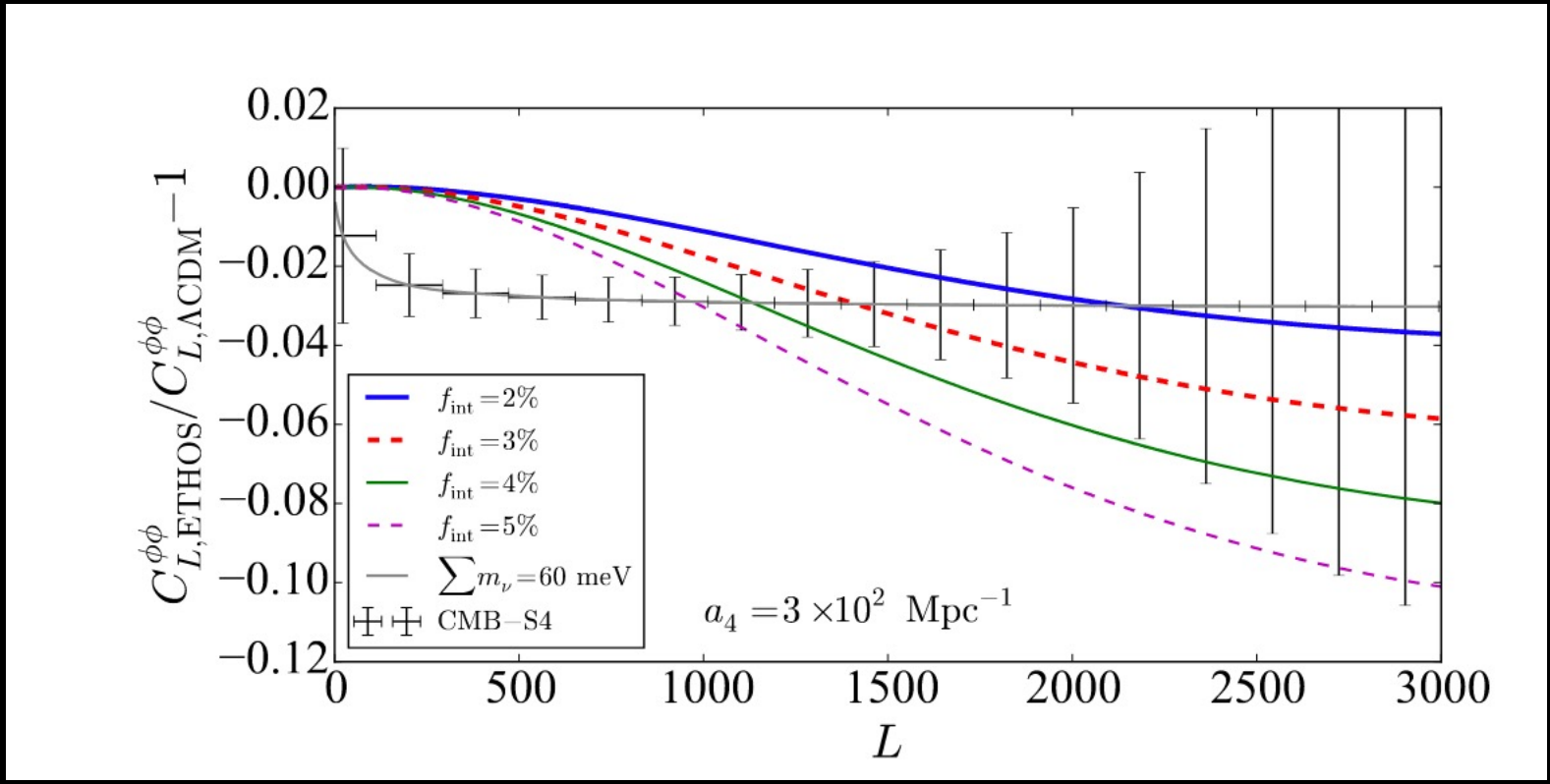


Figure from Abazajian et al. (2016)
Models from Cyr-Racine et al. (2016)

Why is the CMB a powerful probe of dark matter?

- Sensitivity of the CMB measurements to the dark sector do not rely on assumptions about the local dark matter distribution; insensitive to the details of astrophysical modeling.

- Improved measurements of CMB lensing will provide insights into the clustering of matter across a wide range of scales.

- Leap in sensitivity to CMB fluctuations will enable new insights into the nature of dark matter.