# Probing Dark Sectors with Evaporating Black Holes

Michael J. Baker

International Conference on Neutrinos and Dark Matter - NuDM

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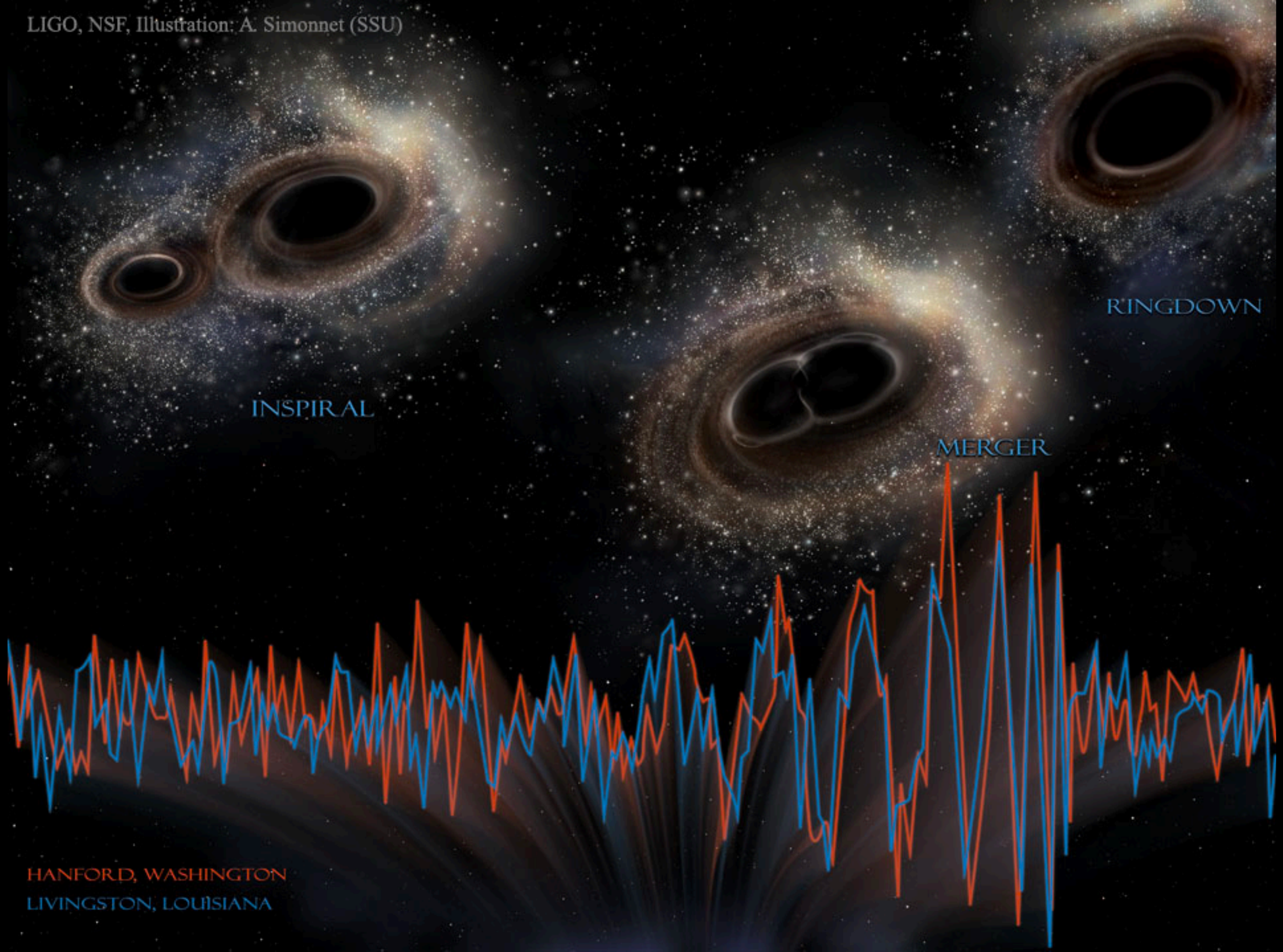
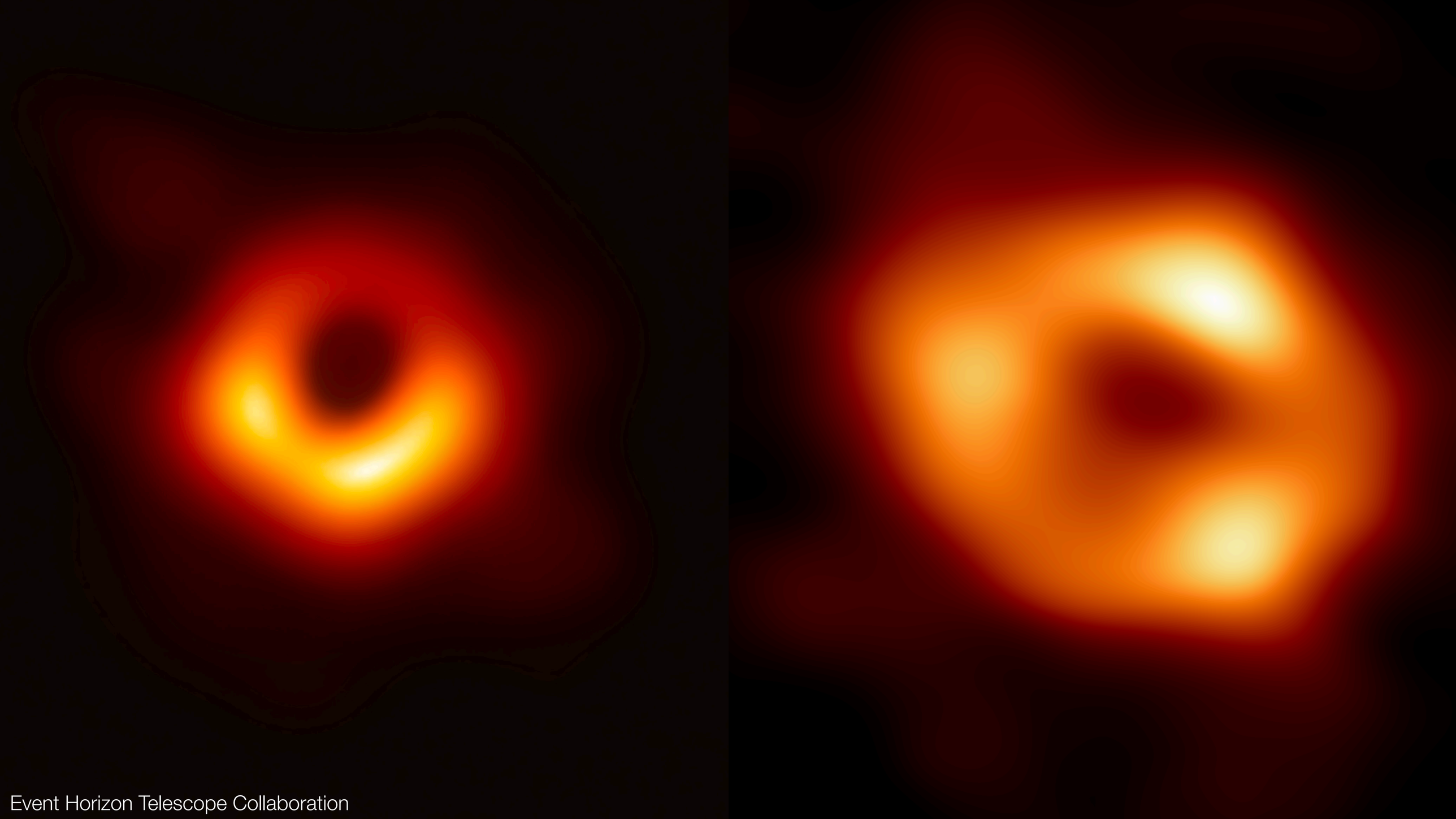
2105.10506 - MJB, A. Thamm


# Introduction


LIGO, NSF, Illustration: A. Simonnet (SSU)
INSPIRAL
MERGER
RINGDOWN
HANFORD, WASHINGTON
LIVINGSTON, LOUISIANA

Event Horizon Telescope Collaboration



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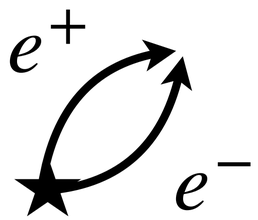

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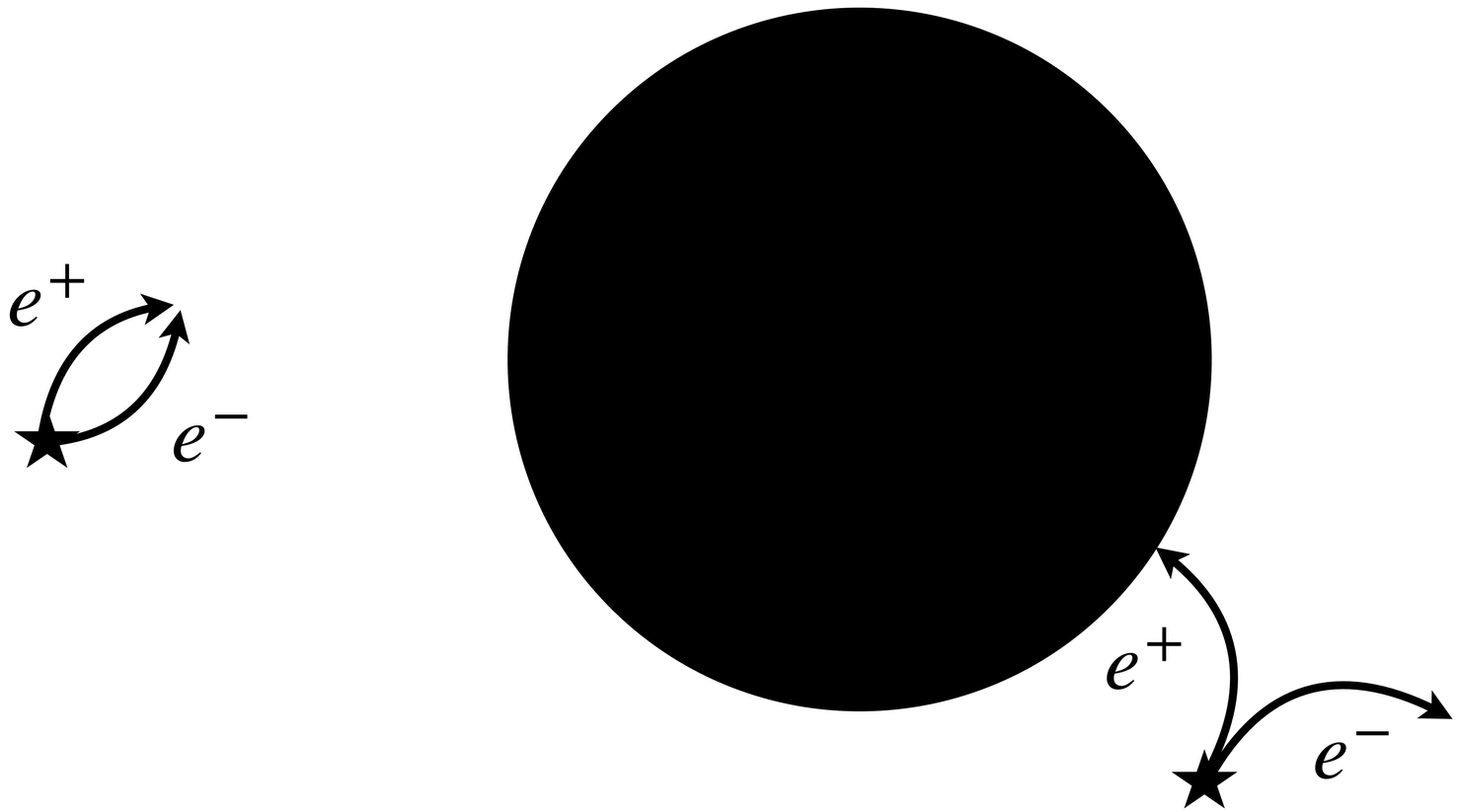

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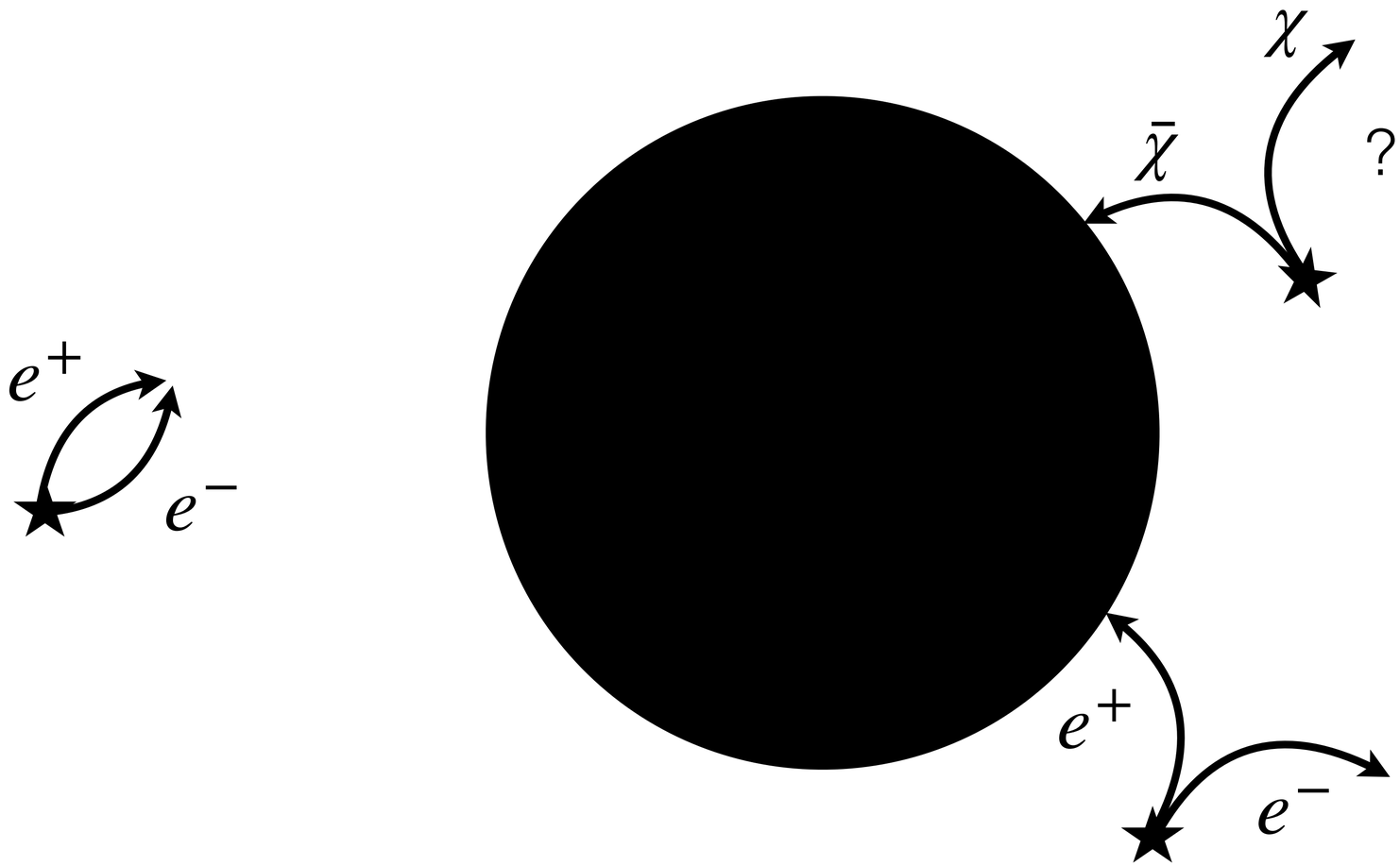

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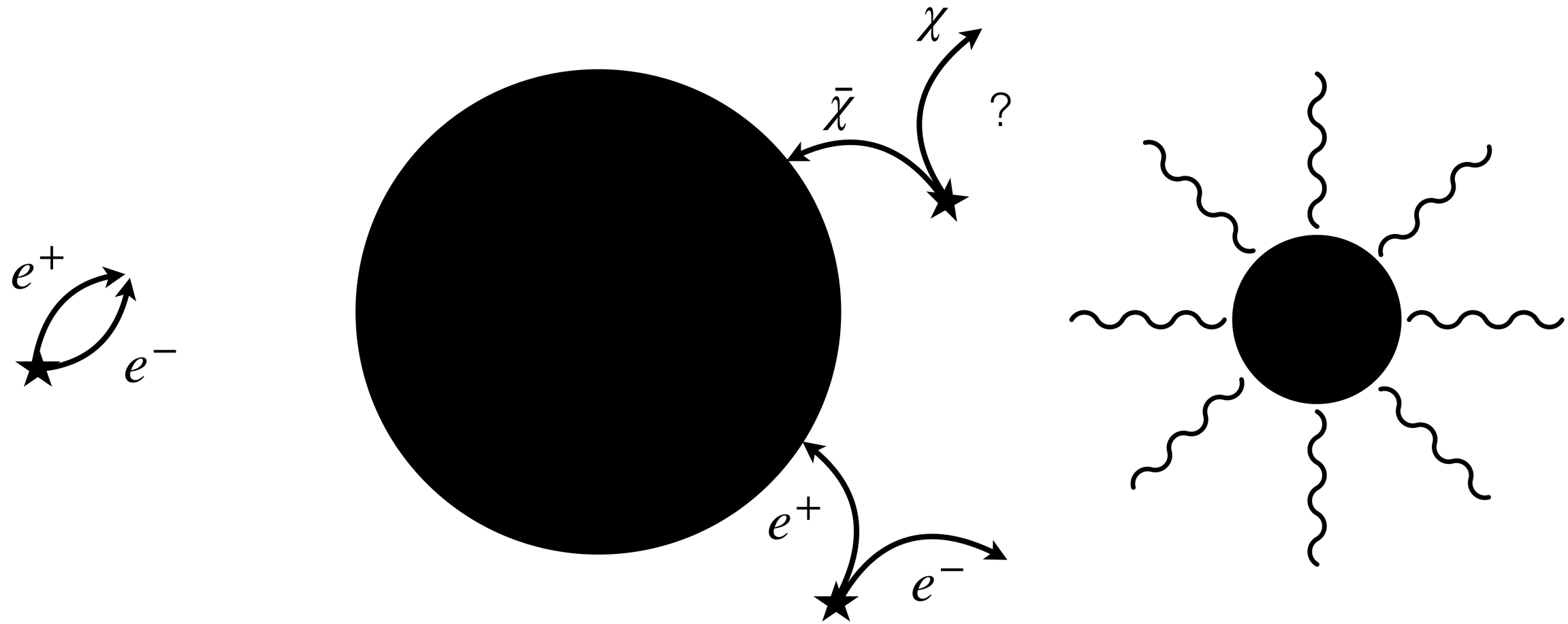

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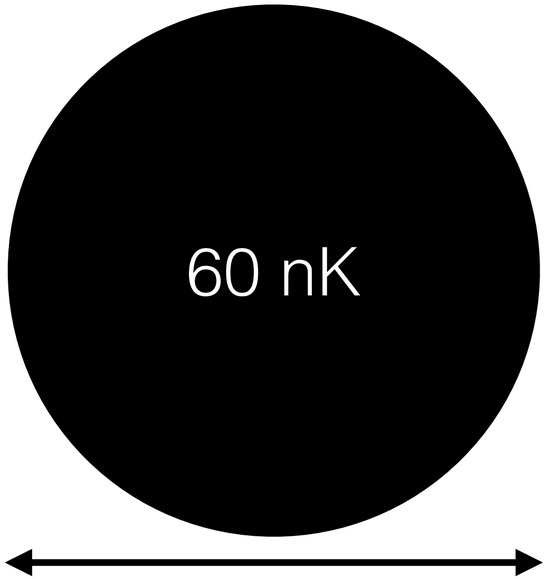
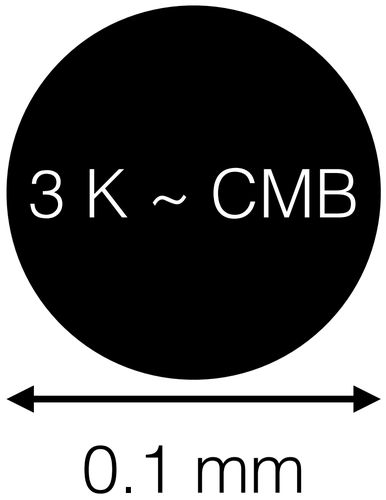
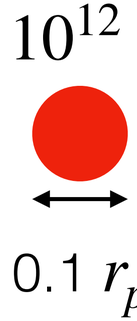
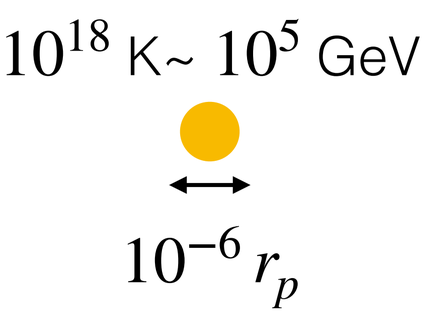
Mass: Sun Moon 10 x  




Lifetime: $10^{67}$ years $10^{44}$ years 13.8 Gyr 1 s

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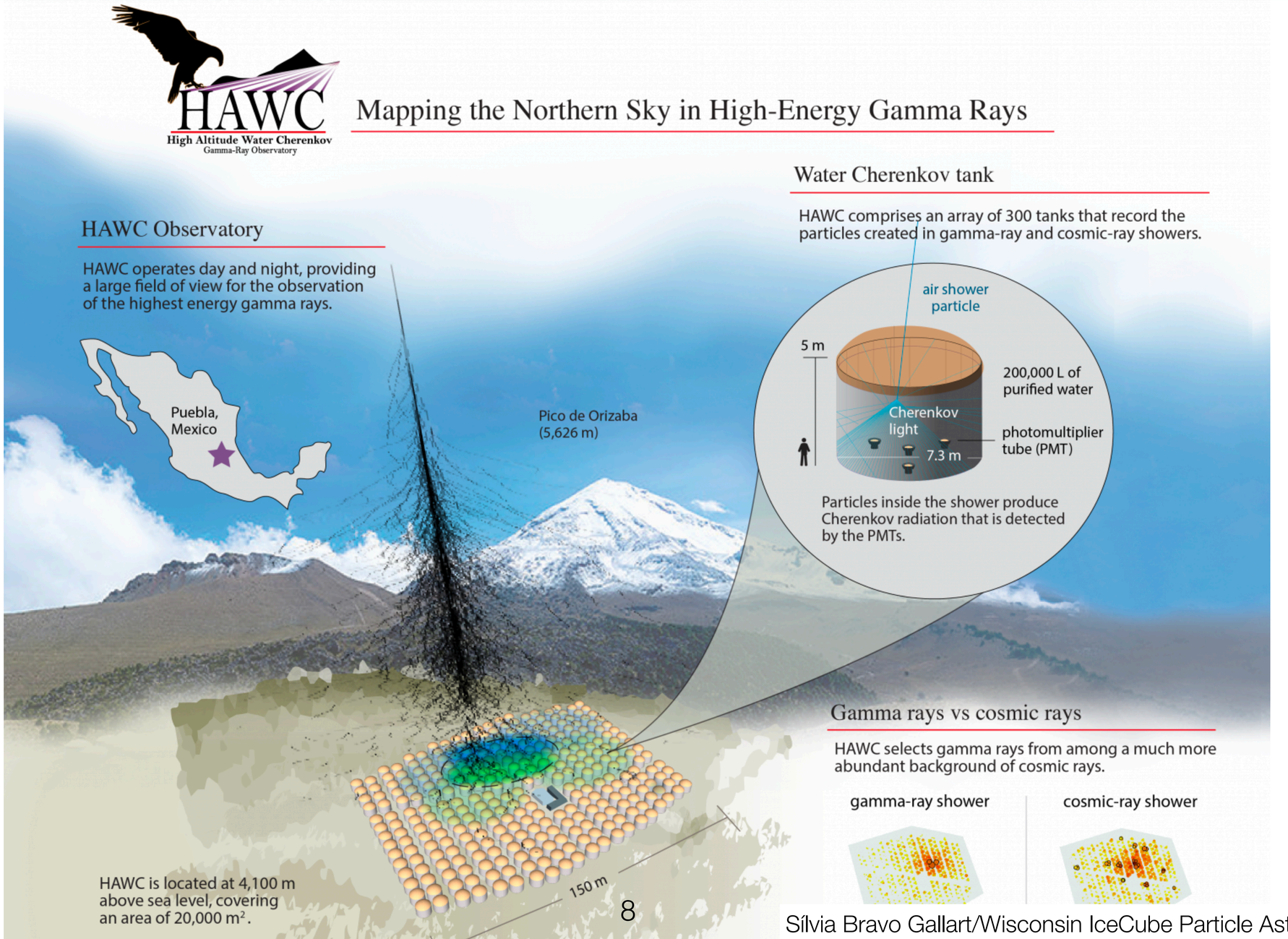
  - Could possibly constitute dark matter

# HAWC Observatory






Sílvia Bravo Gallart/Wisconsin IceCube Particle Astrophysics Center (WIPAC)

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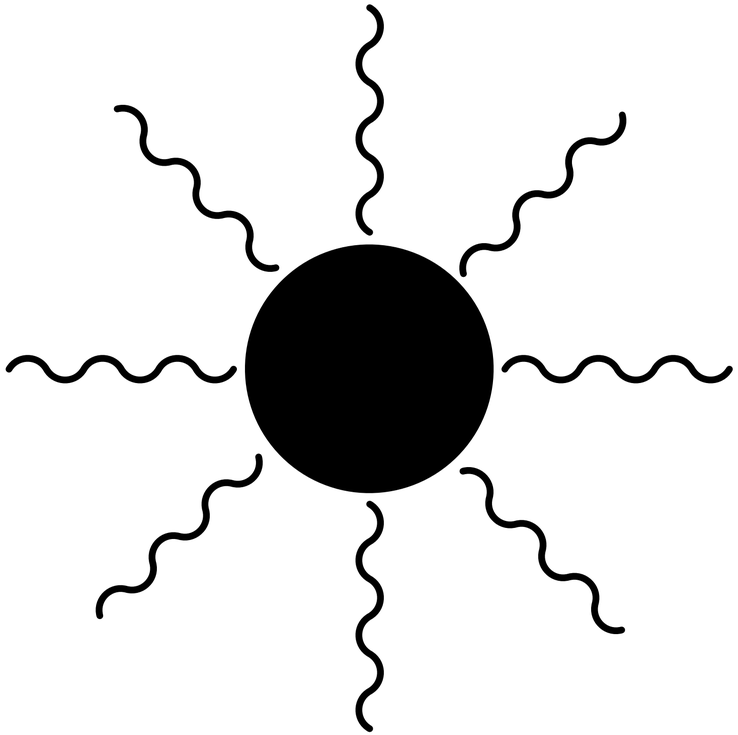
- We ask the question:
  - What could we learn about BSM physics (e.g., dark sectors) if an evaporating black hole were observed today?

# Probing Dark Sectors with Evaporating Black Holes

# Primary Particles and Mass Evolution



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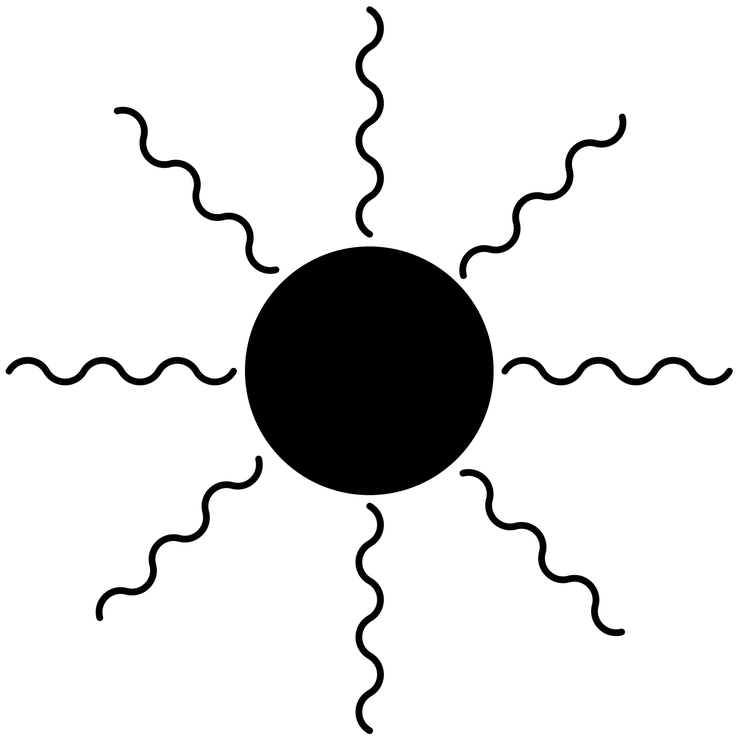

$$\frac{d^2 N_{\mathrm{p}}^i}{dt dE} = \frac{n_{\mathrm{dof}}^i \Gamma^i(M, E)}{2\pi(e^{E/T} \pm 1)}$$

$$T = \frac{1}{8\pi GM}$$

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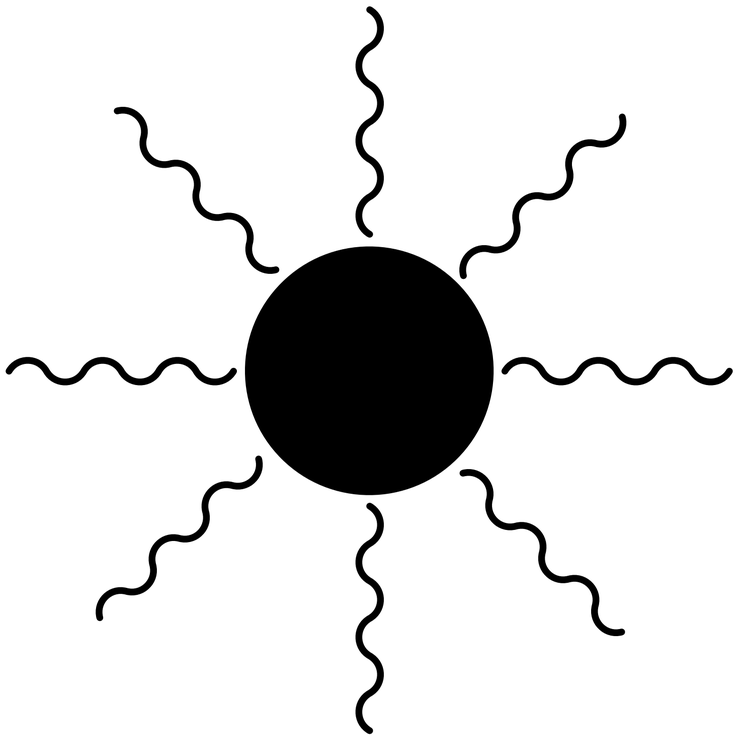

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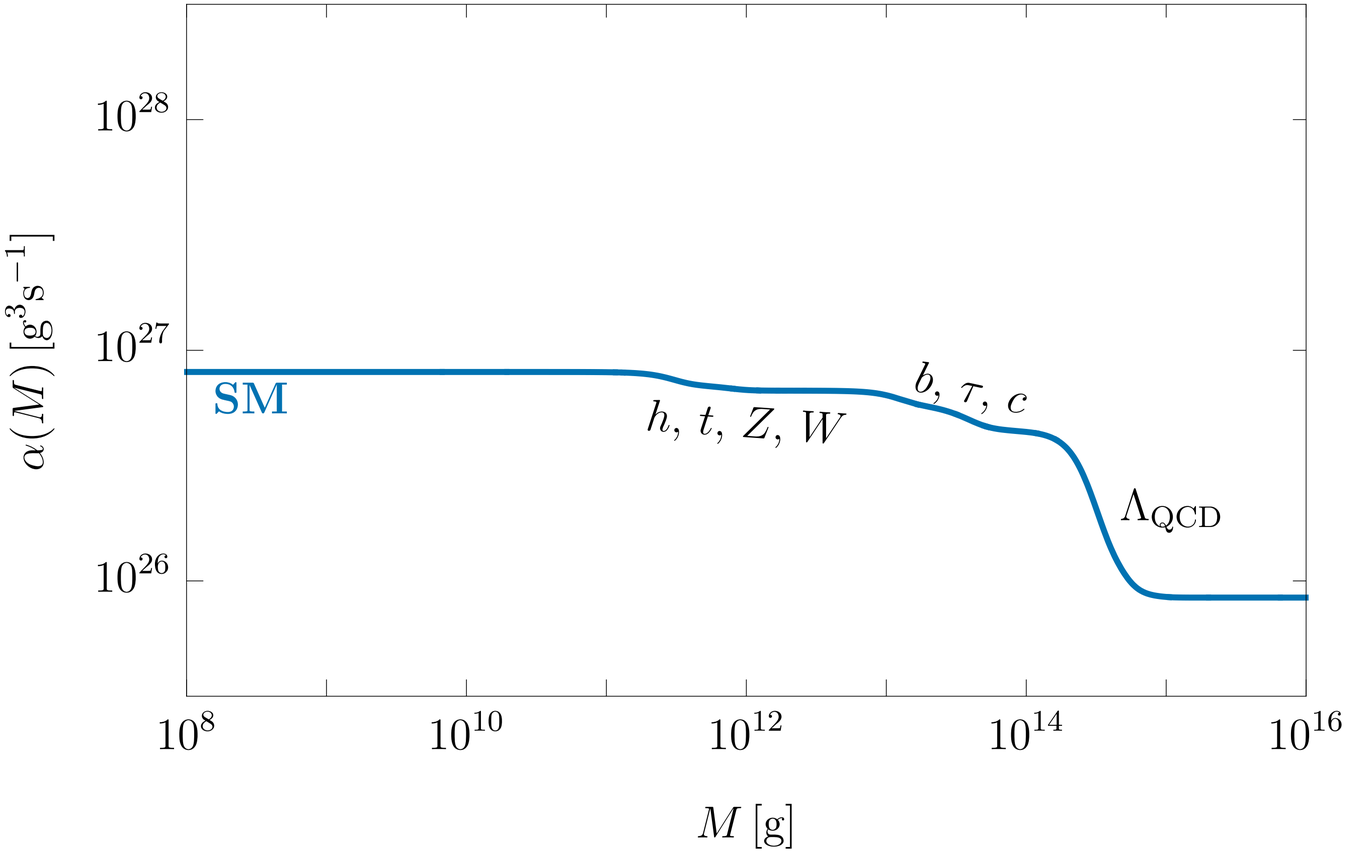
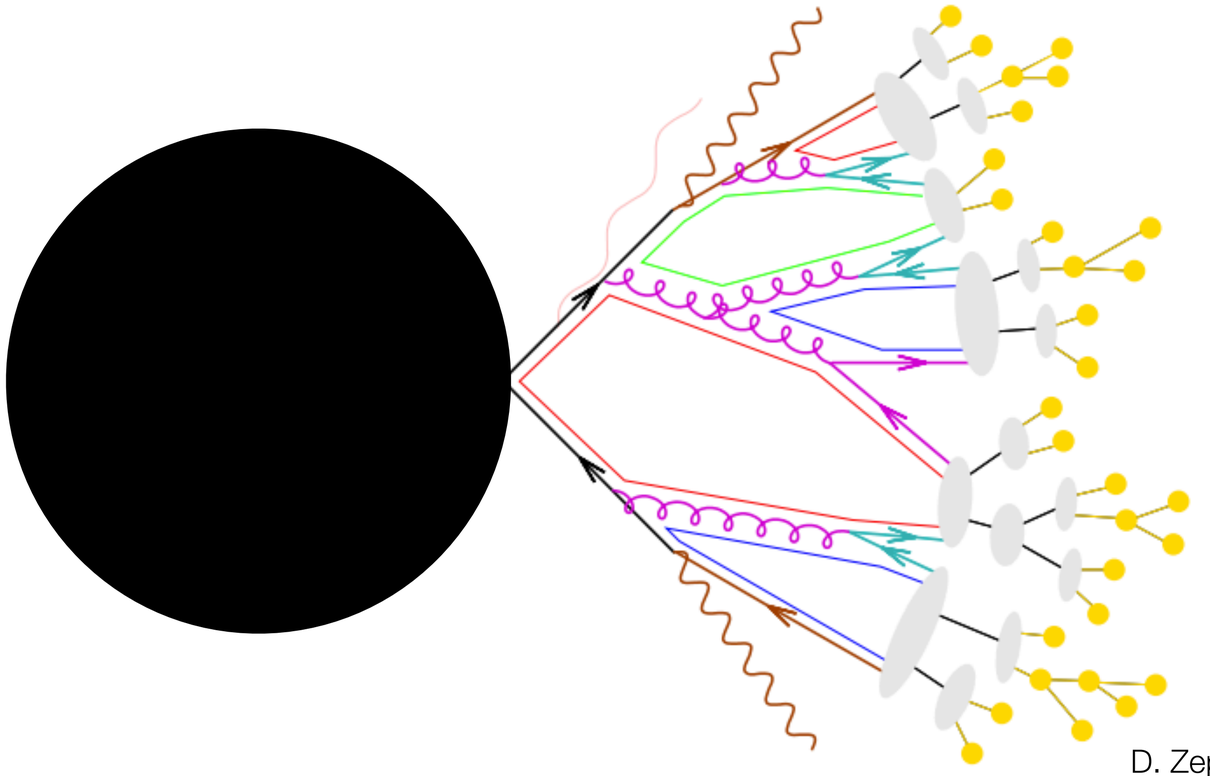


# Secondary Photons



D. Zeppenfeld

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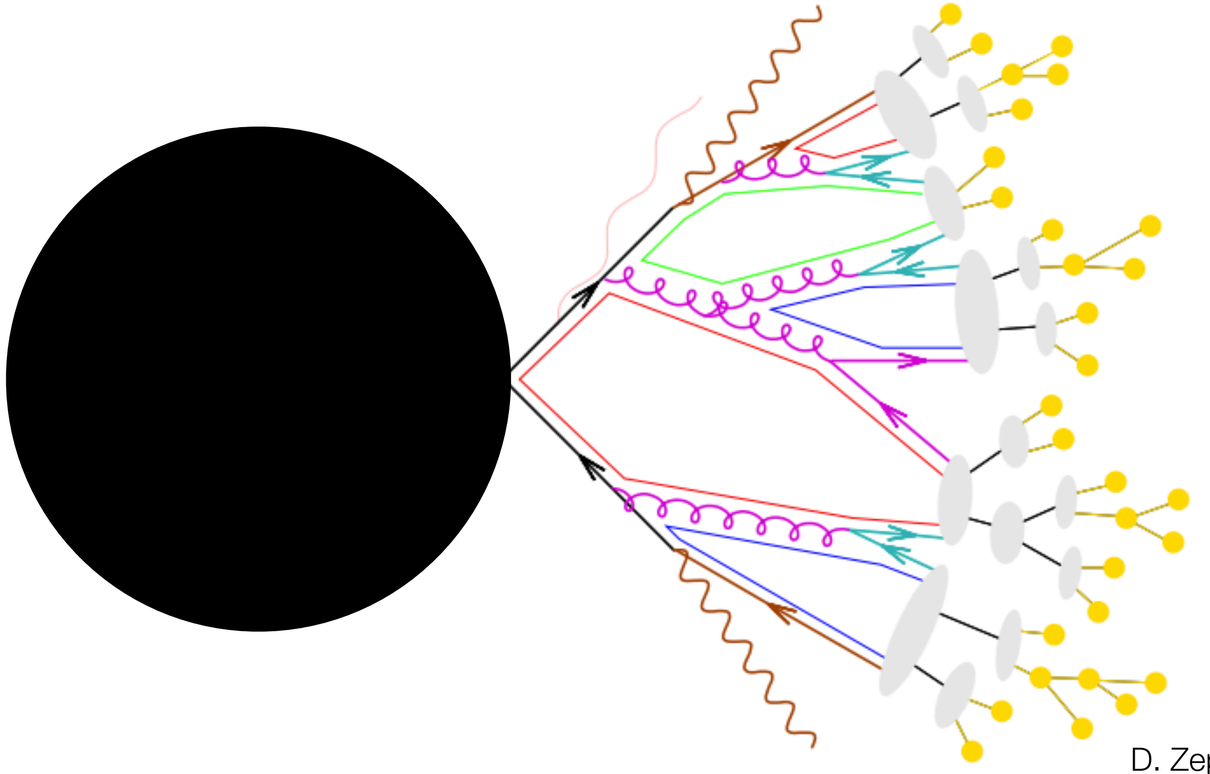

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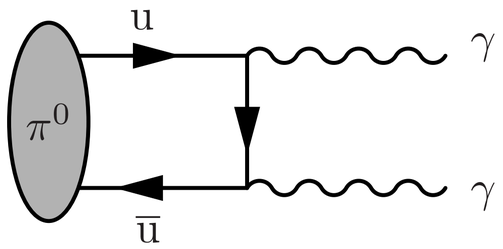

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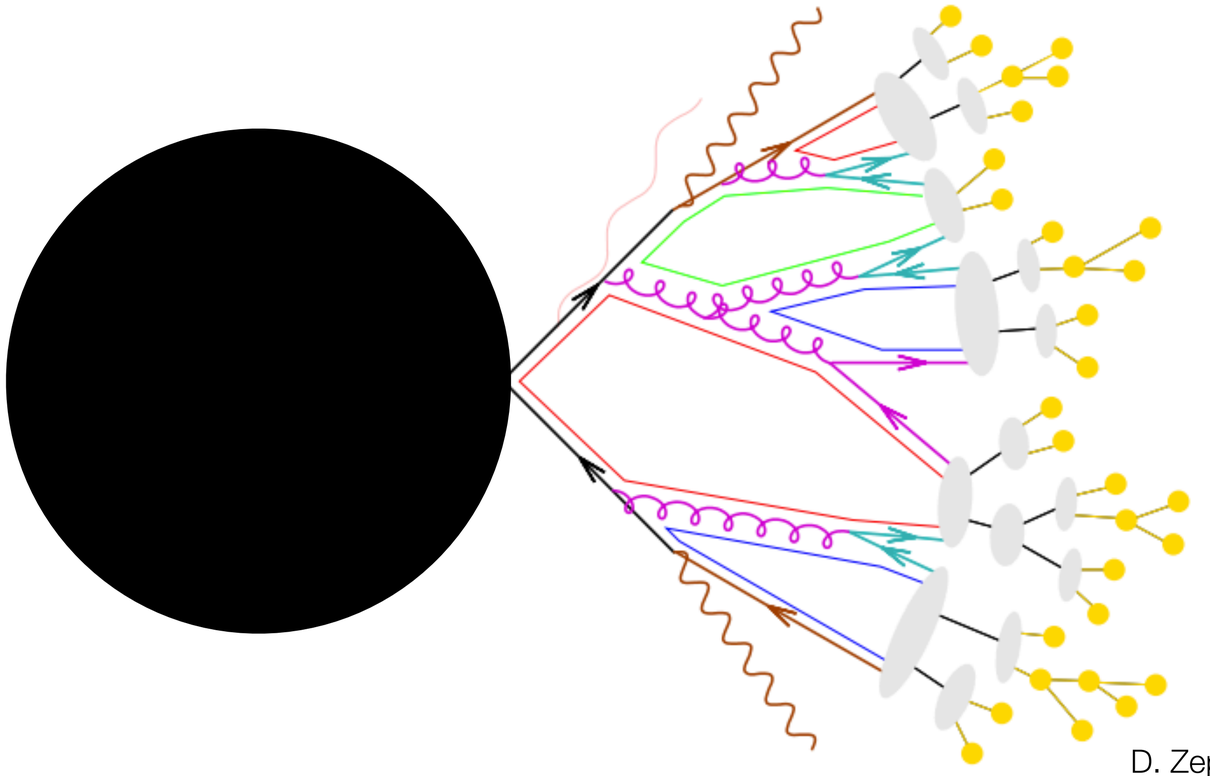

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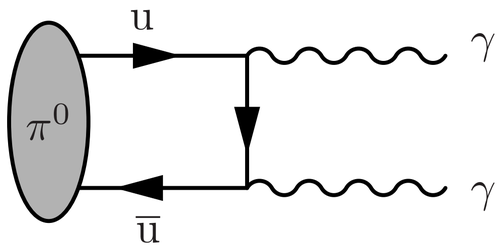


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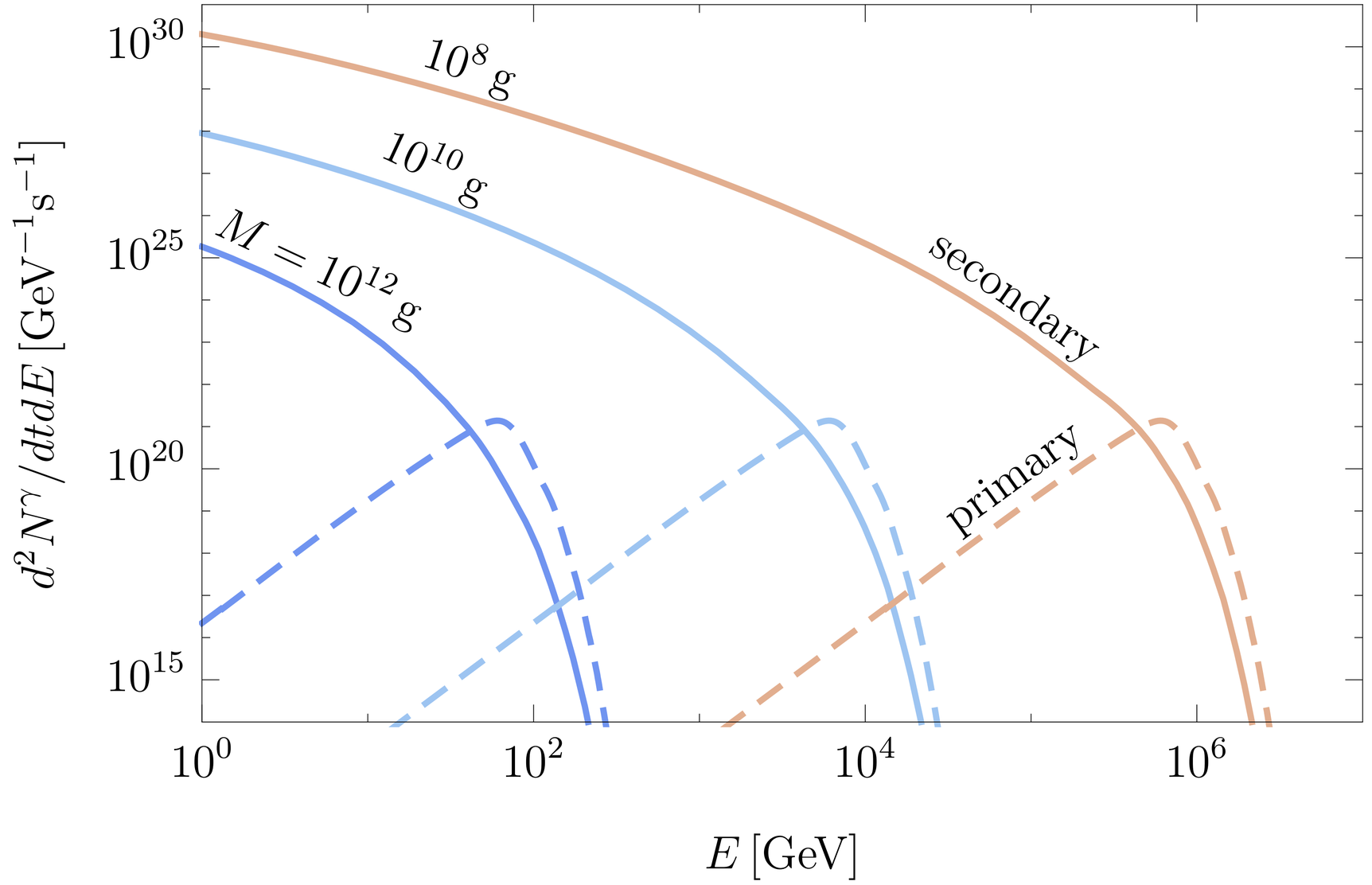
# Primary and Secondary Spectra



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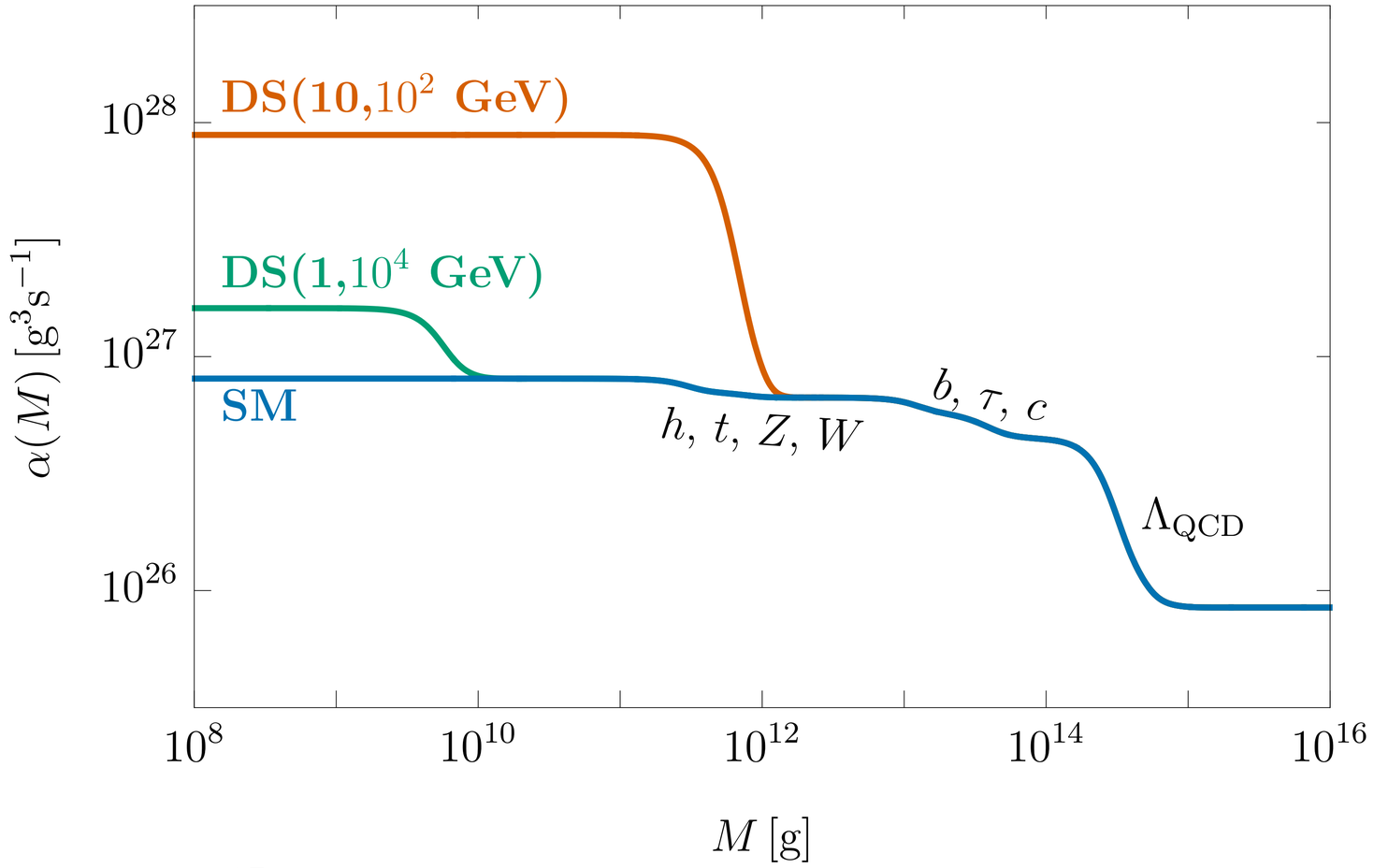

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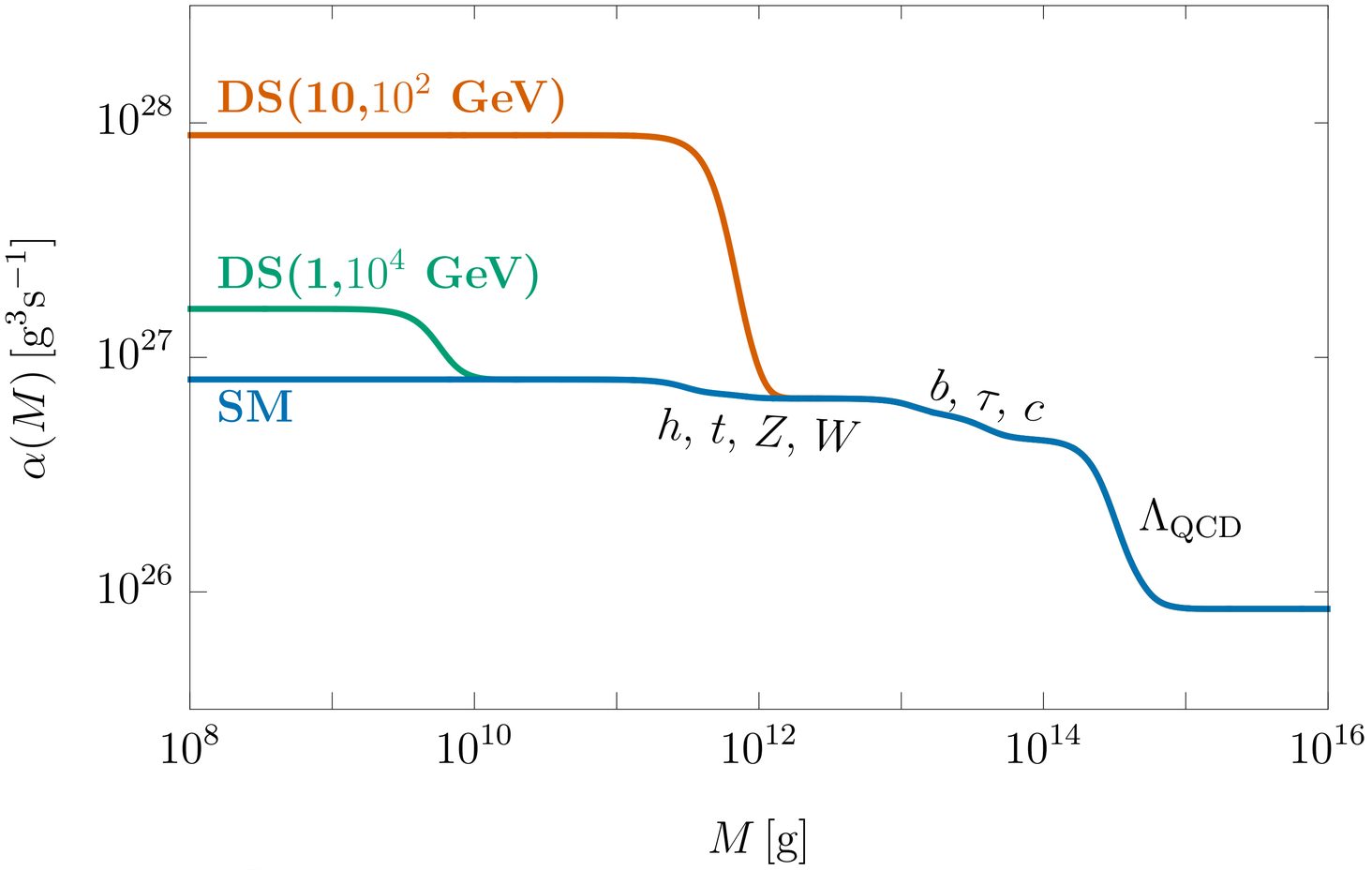
DS consists of $N$ copies of the SM particles at common mass scale $\Lambda_{DS}$



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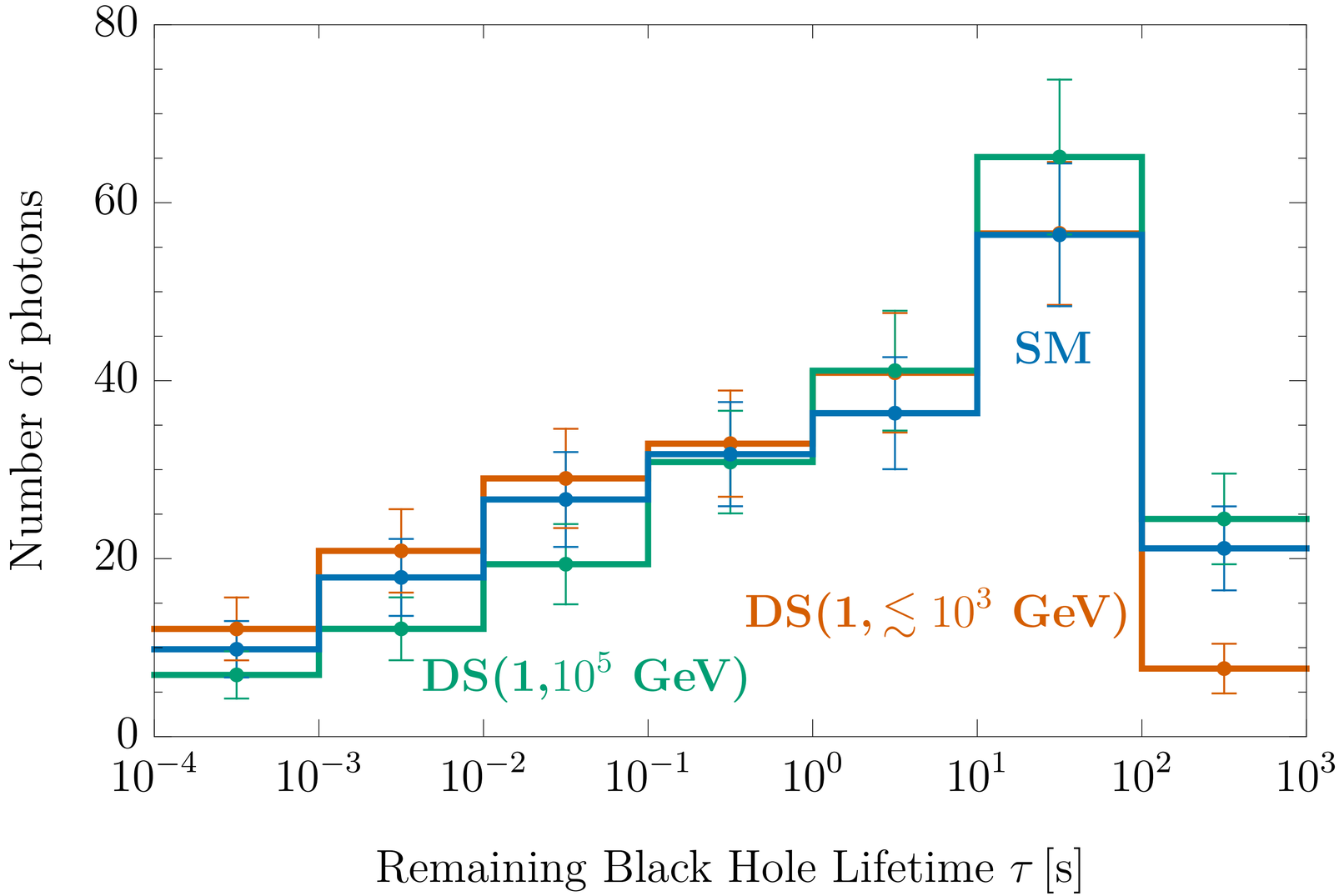
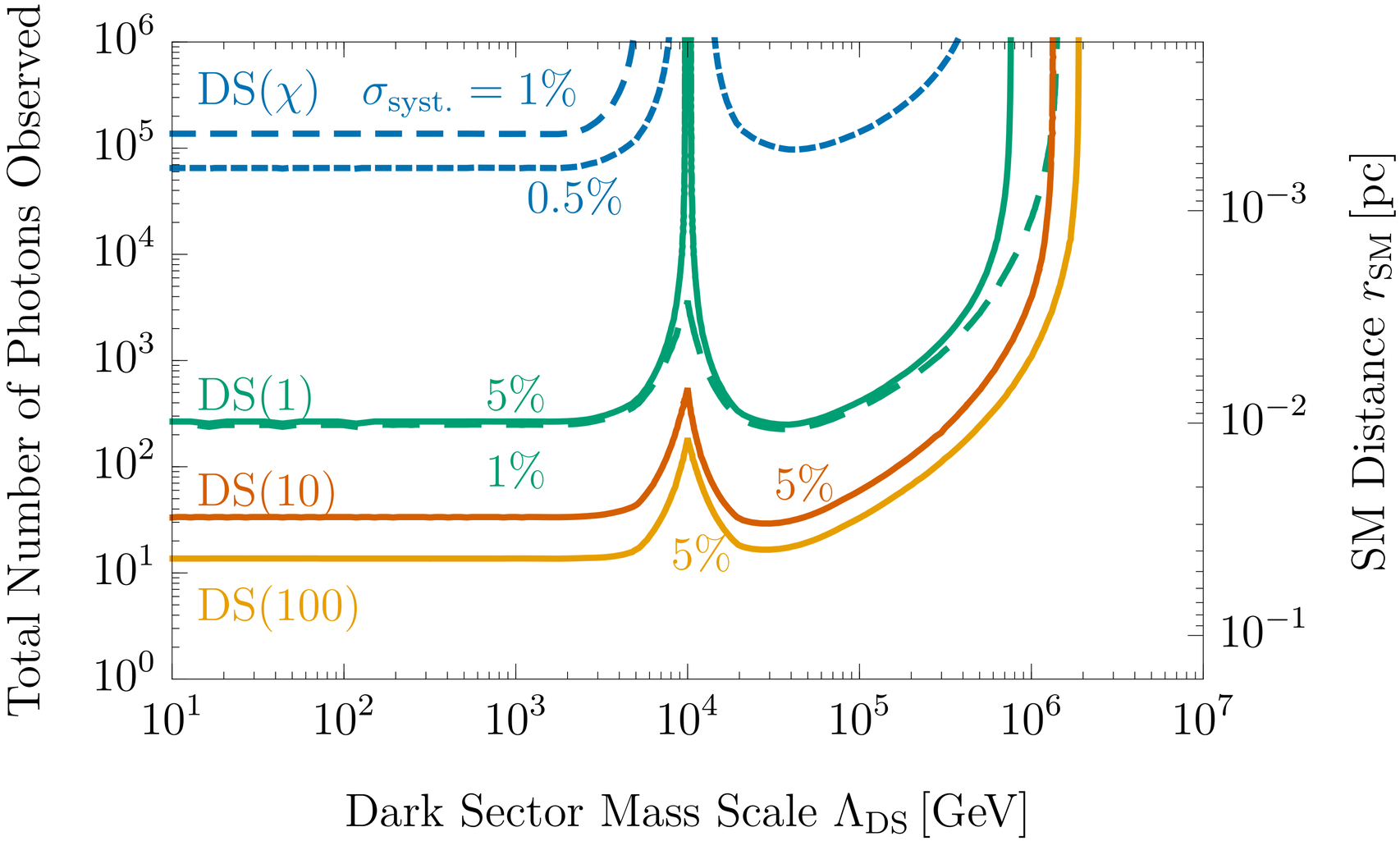


# Dark Sector Exclusion Plot



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Production & propagation of antiprotons, QCD, BSM

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