

# Indirect Searches for the Dark Photon Trident

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# Based on previous and on-going works

1. Tim Linden, **TTQN**, Tim Tait, *X-ray Searches for the Dark Photon Trident*, arXiv:2406.xxxx.
2. Tim Linden, **TTQN**, Tim Tait, *Indirect Searches for Dark Photon-Photon Tridents in Celestial Objects*, arXiv:2402.01839.
3. **TTQN**, Tim Tait, *Bounds on Long-lived Dark Matter Mediators from Neutron Stars*, **PRD 107**, arXiv:2212.12547.
4. Isabelle John, Tim Linden, **TTQN**, Tim Tait, *in prep.*
5. Milena Crnogorčević, Tim Linden, **TTQN**, *in prep.*



**Axion**

**Physicist**

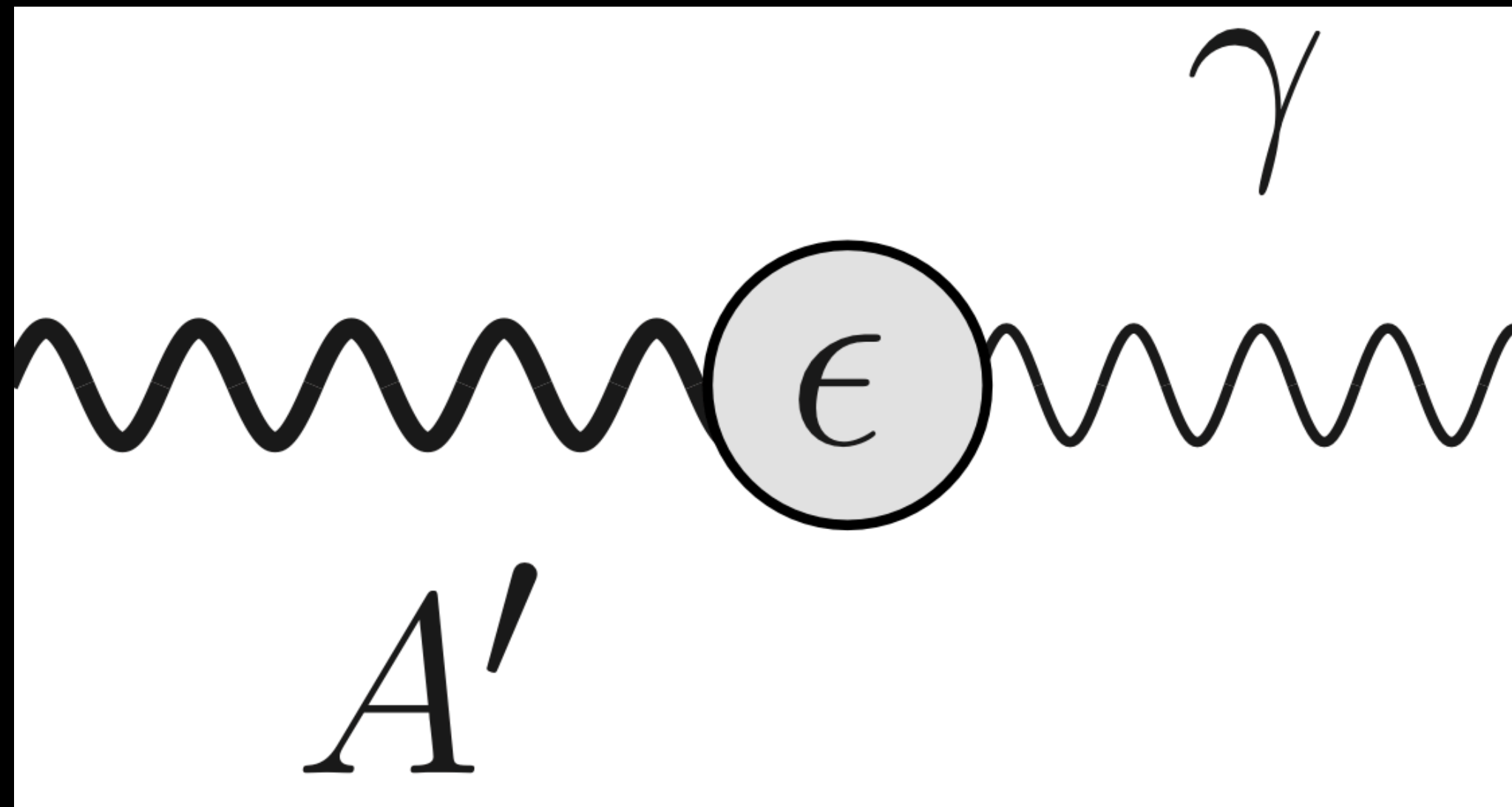
**Dark Photon**

# Dark photon

$$\mathcal{L} \supset -\frac{1}{4}F'_{\mu\nu}F'^{\mu\nu} - \frac{1}{2}m_{A'}^2 A'_\mu A'^\mu - \frac{\epsilon}{2}F'_{\mu\nu}F^{\mu\nu}$$

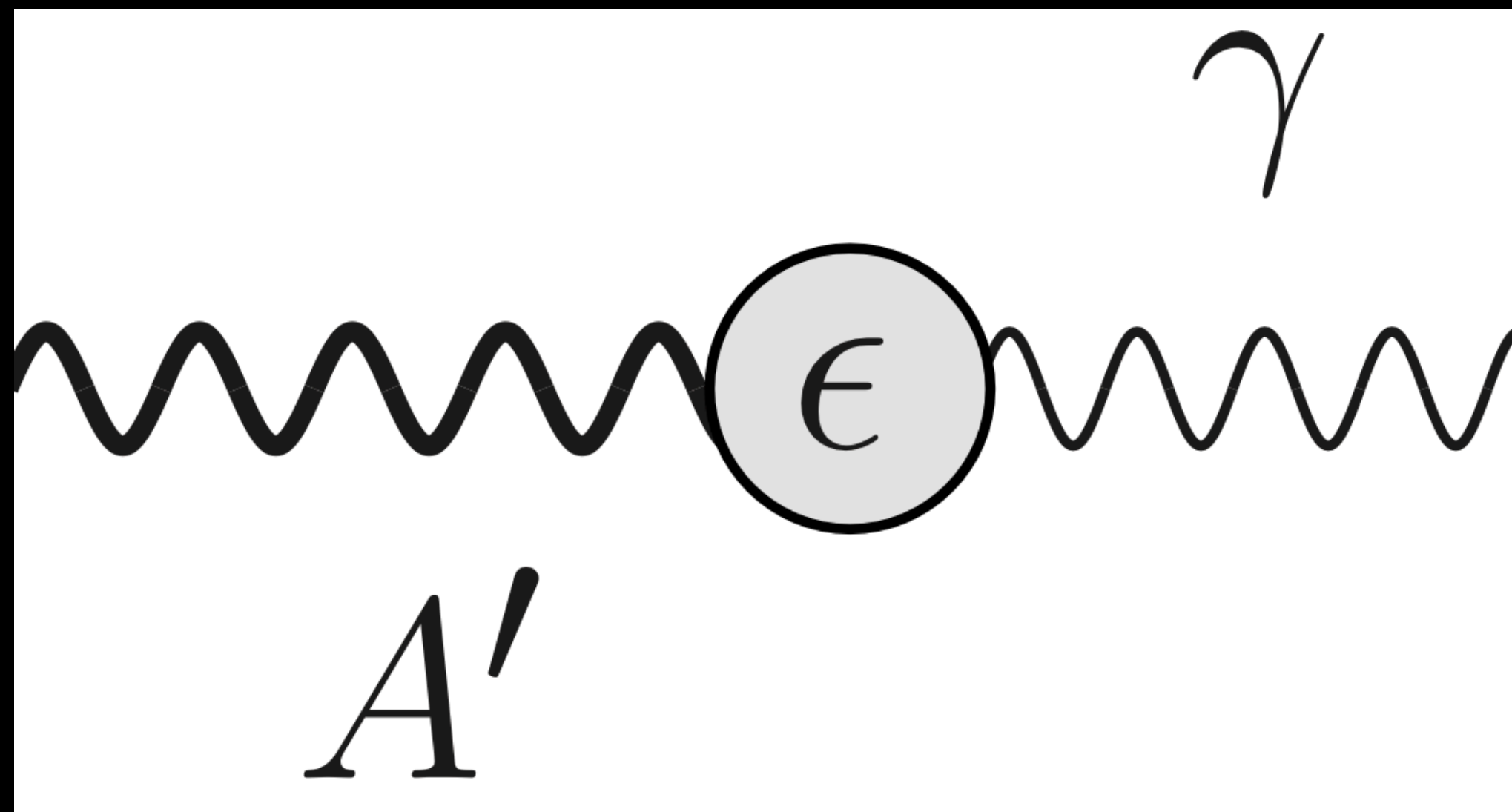
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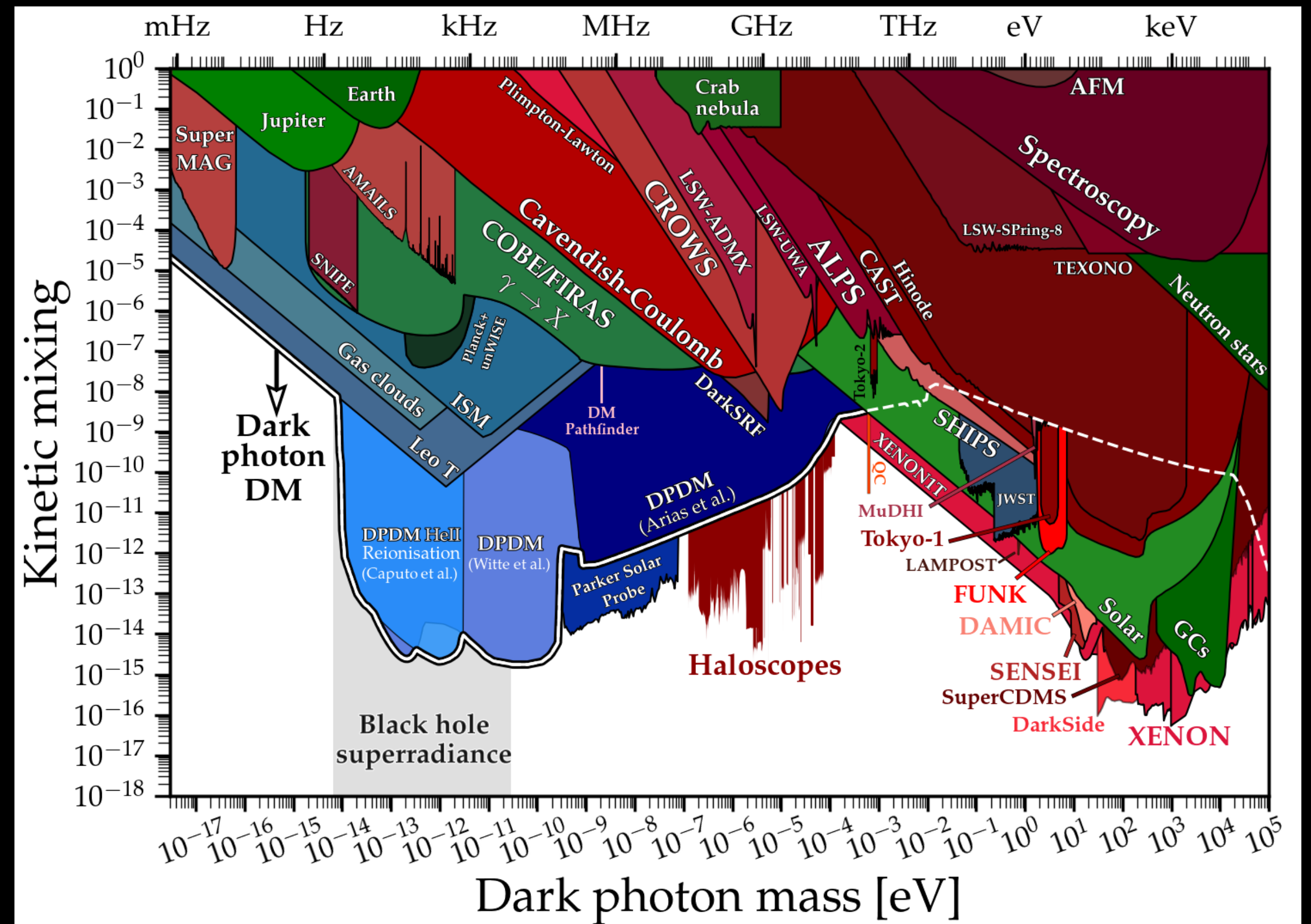
# Dark photon

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Caputo, O'Hare, Millar, Vitagliano

(2105.04565)



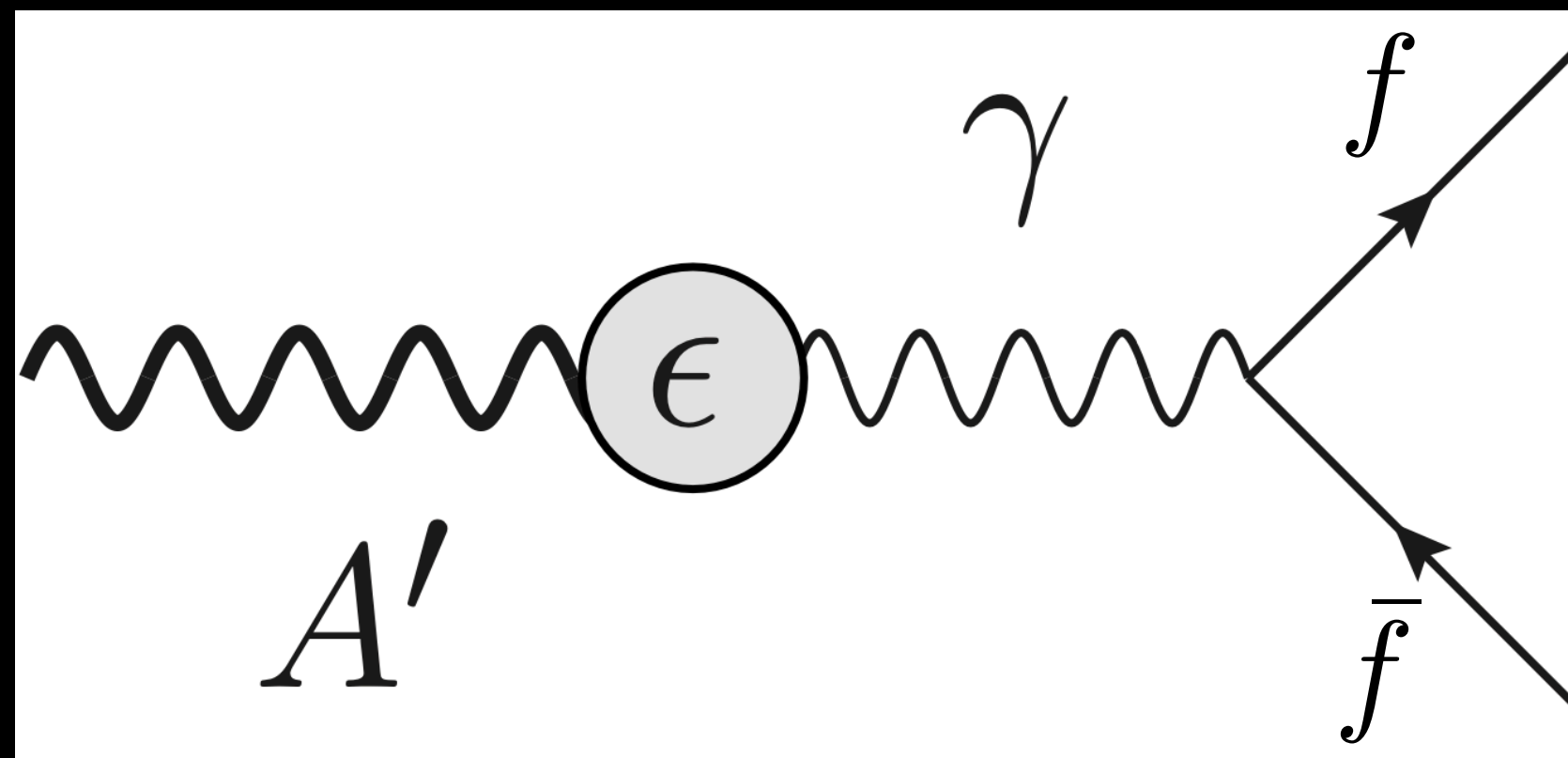
# The Dark Photon Trident

**Dark Photon Dark Matter decay**

# The Dark Photon Trident

## Dark Photon Dark Matter decay

$$m_{A'} > 2m_f$$

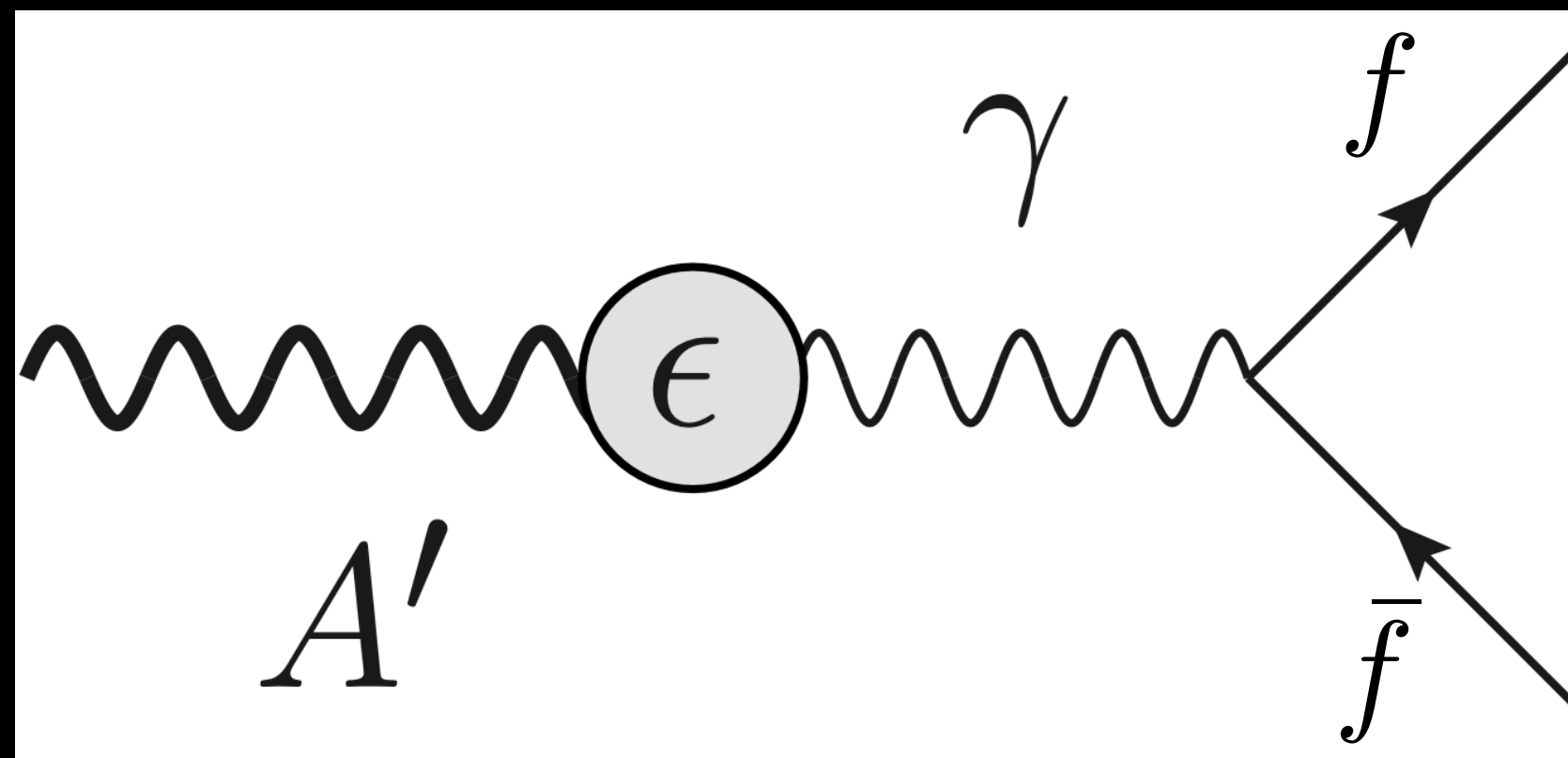




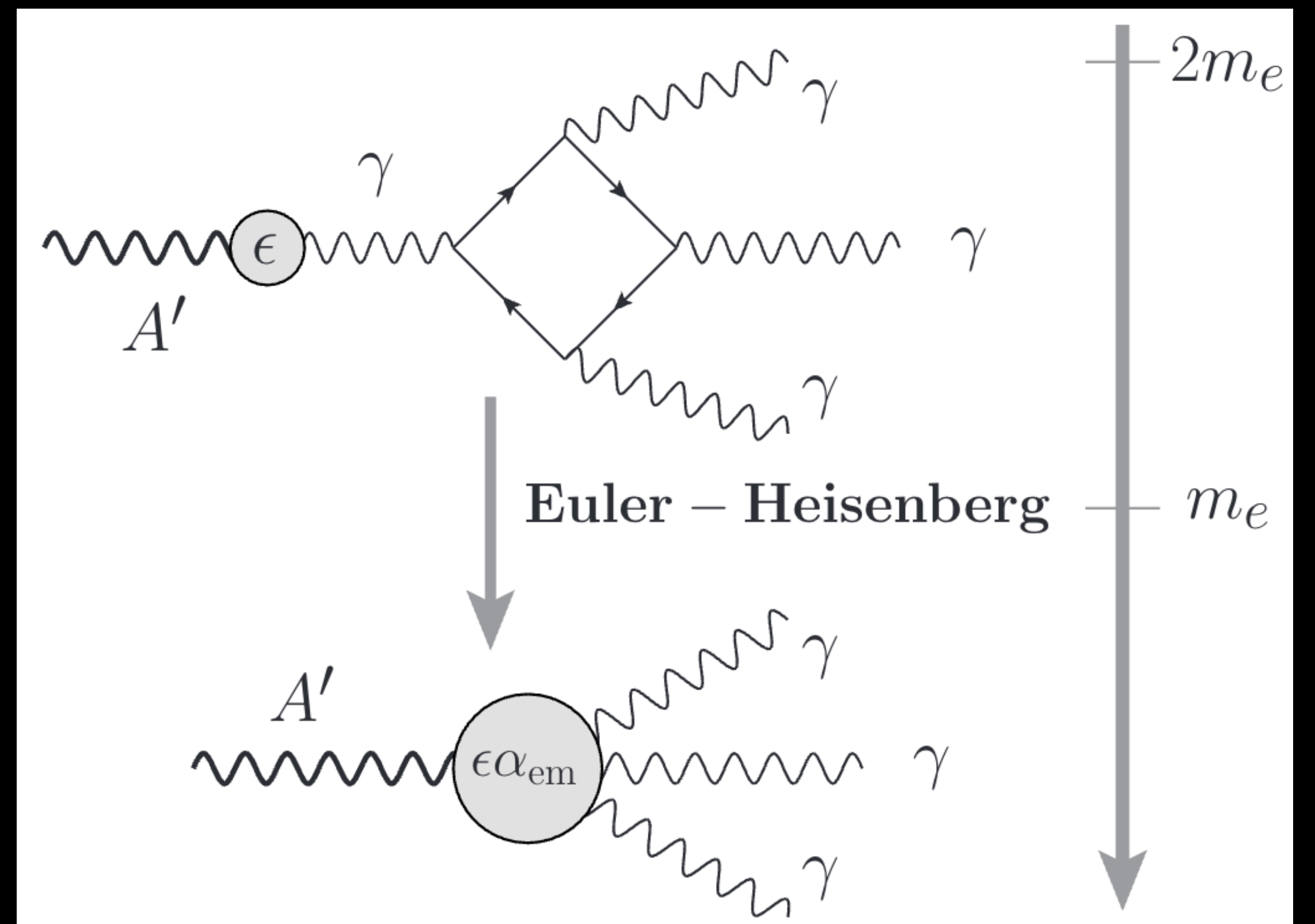
# The Dark Photon Trident

## Dark Photon Dark Matter decay

$$m_{A'} > 2m_f$$

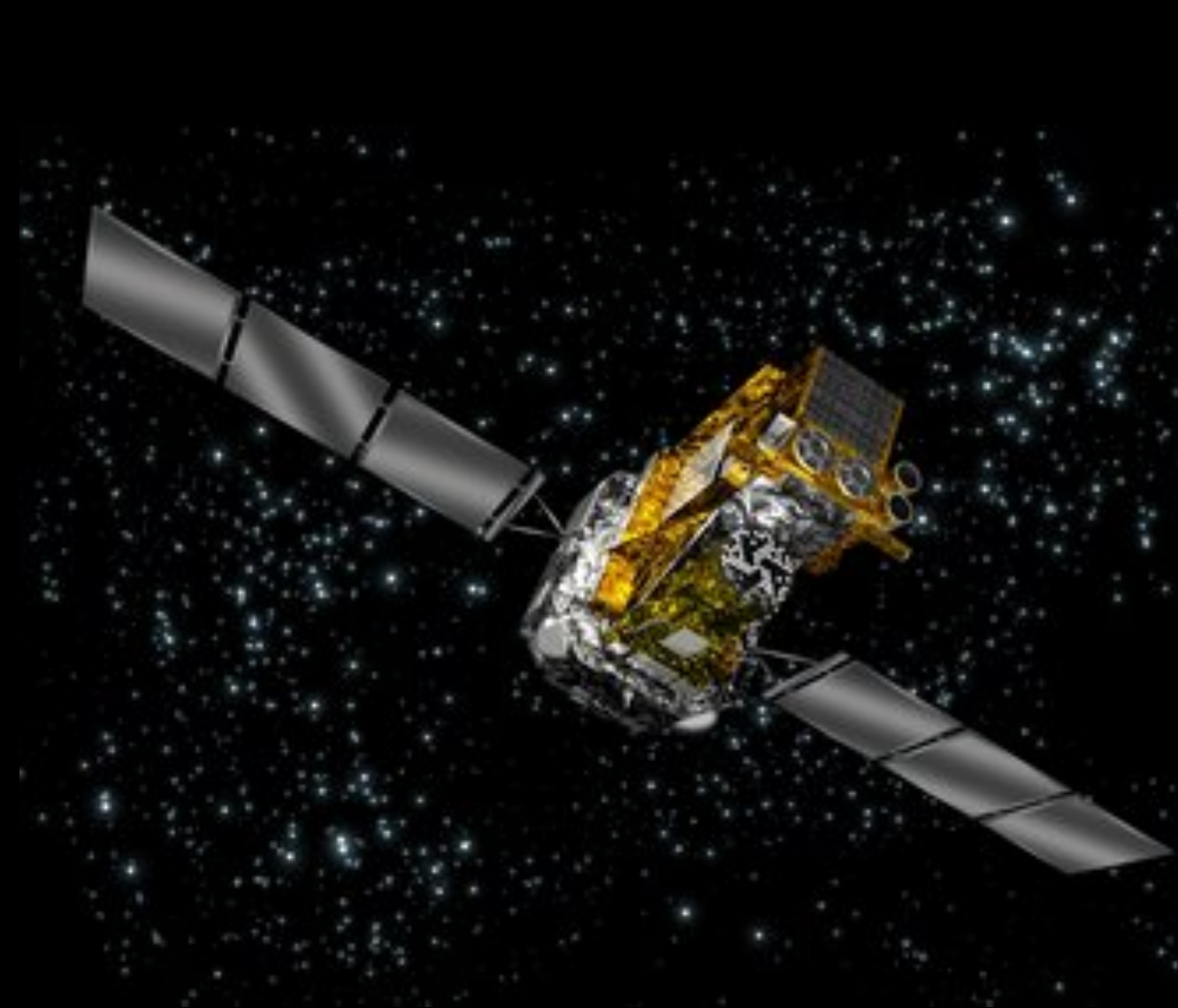
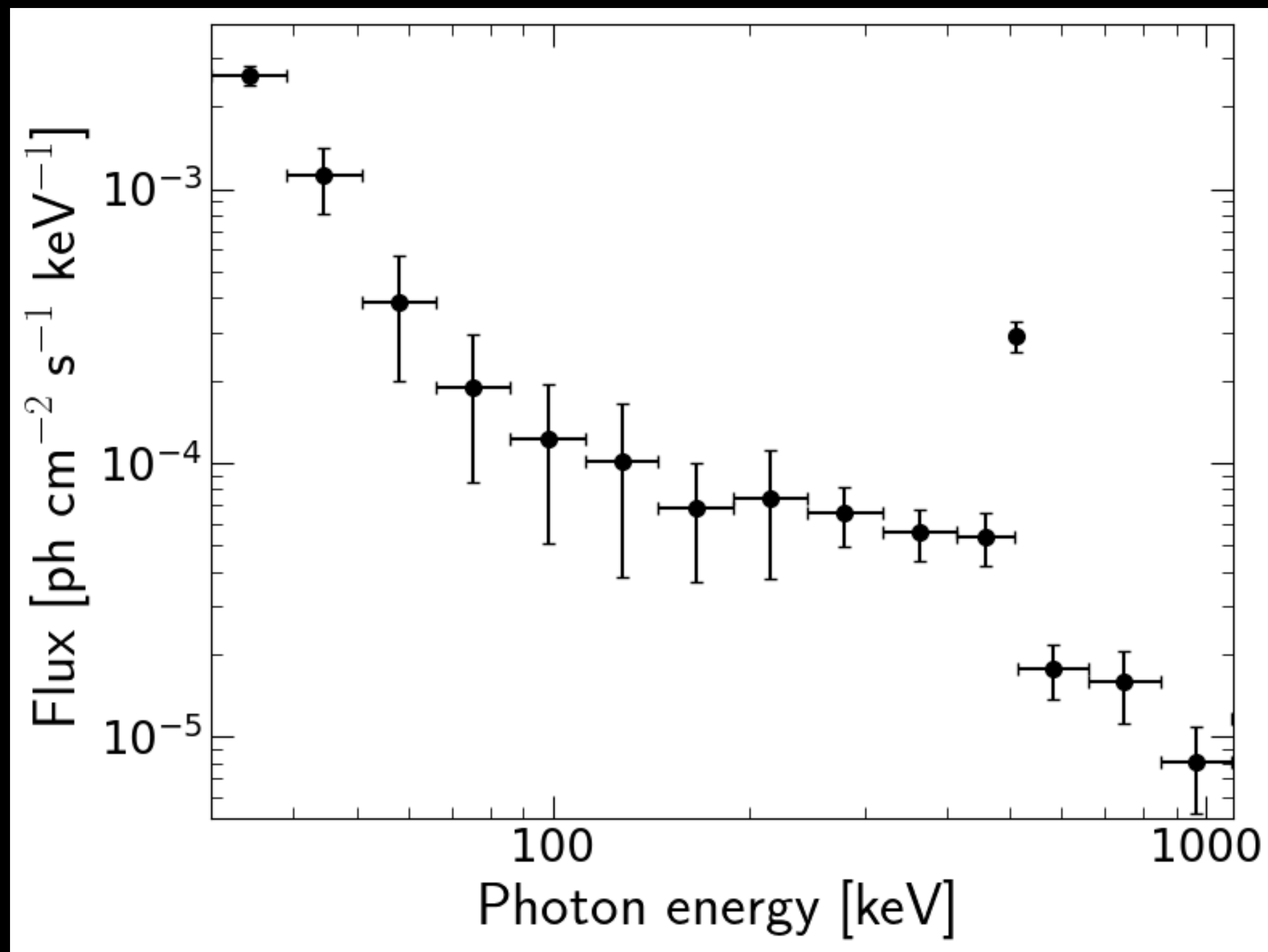


$$m_{A'} \leq 2m_e$$



- Pospelov (0811.1030)
- Postma, Redondo (0811.0326)

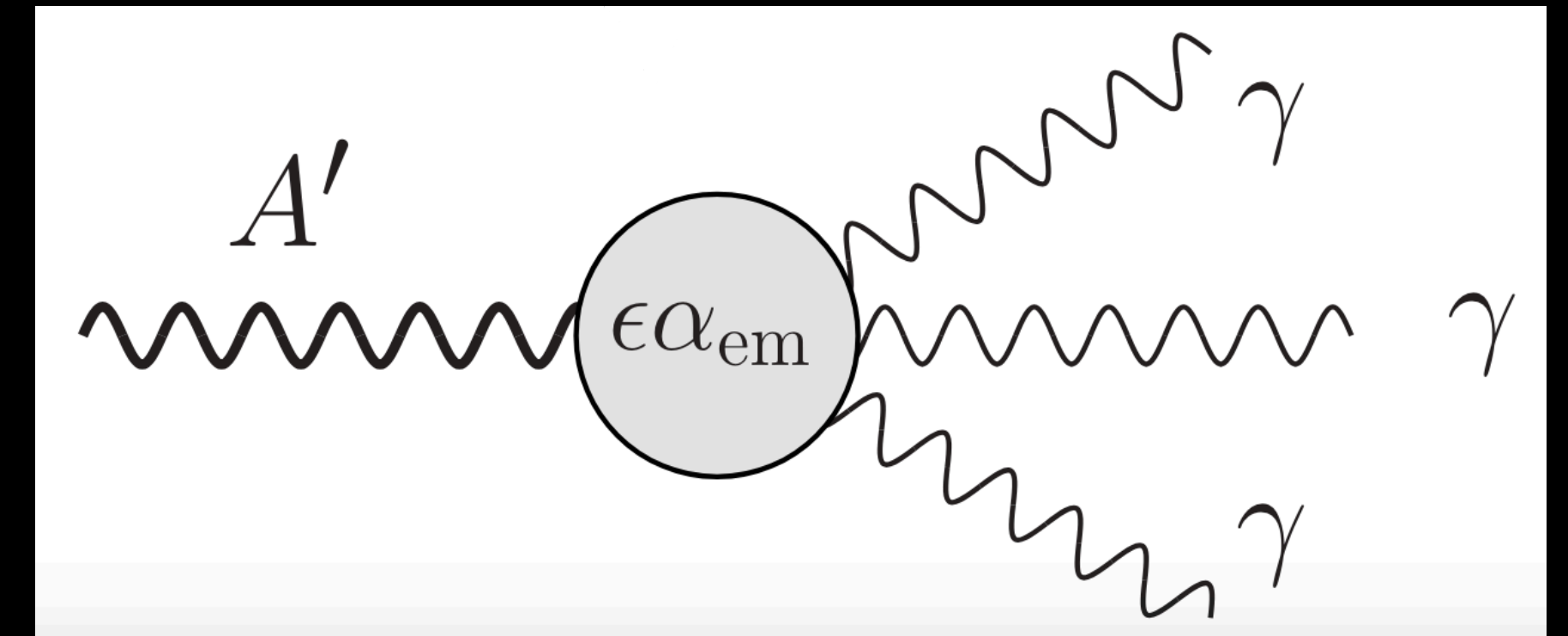
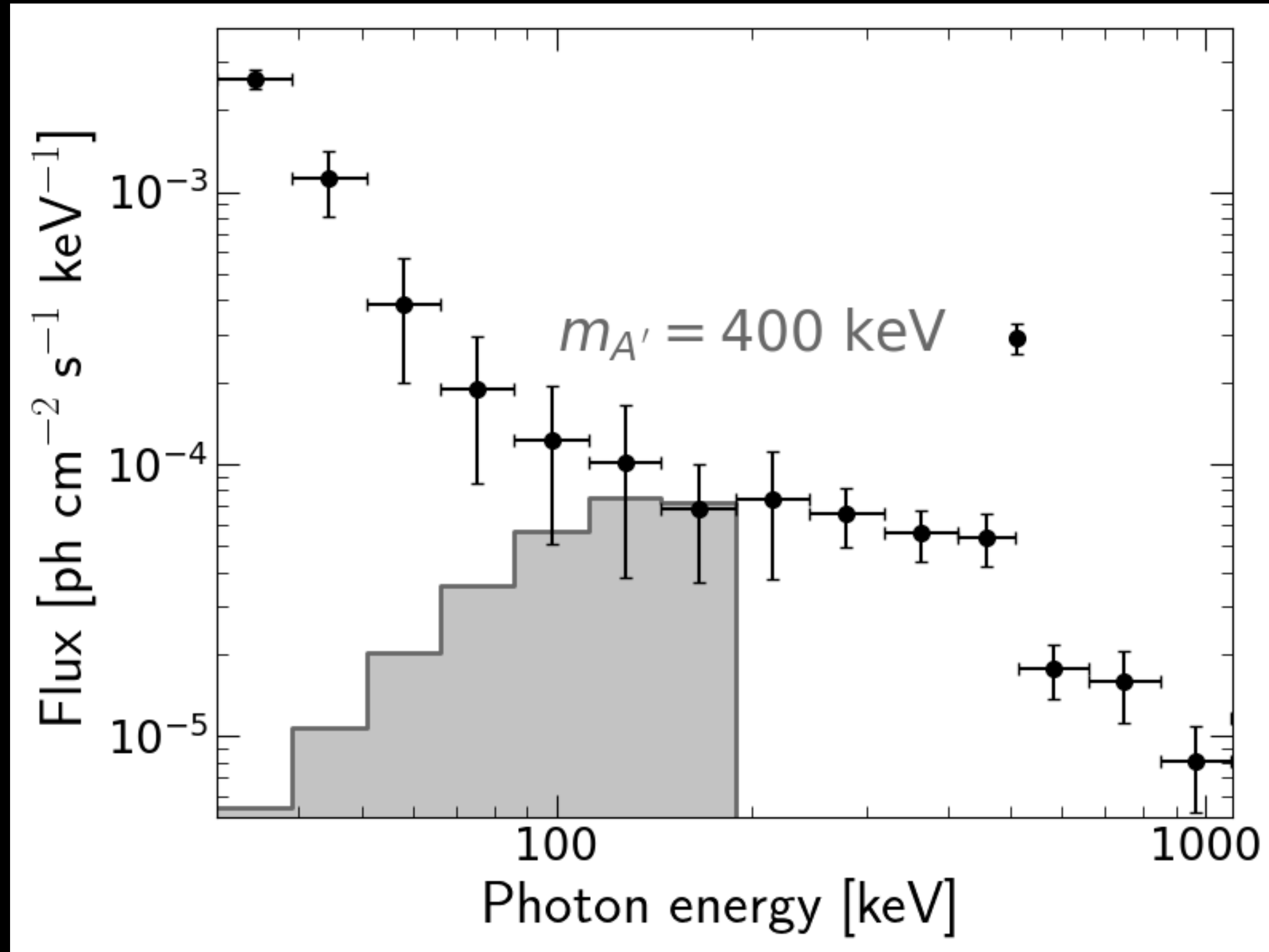
# INTEGRAL/SPI 16 years-data



Tool: 3ML (1507.08343)

Template: Thomas Siegert, Francesca Calore, and collaborators (2209.06299, 2202.07483)

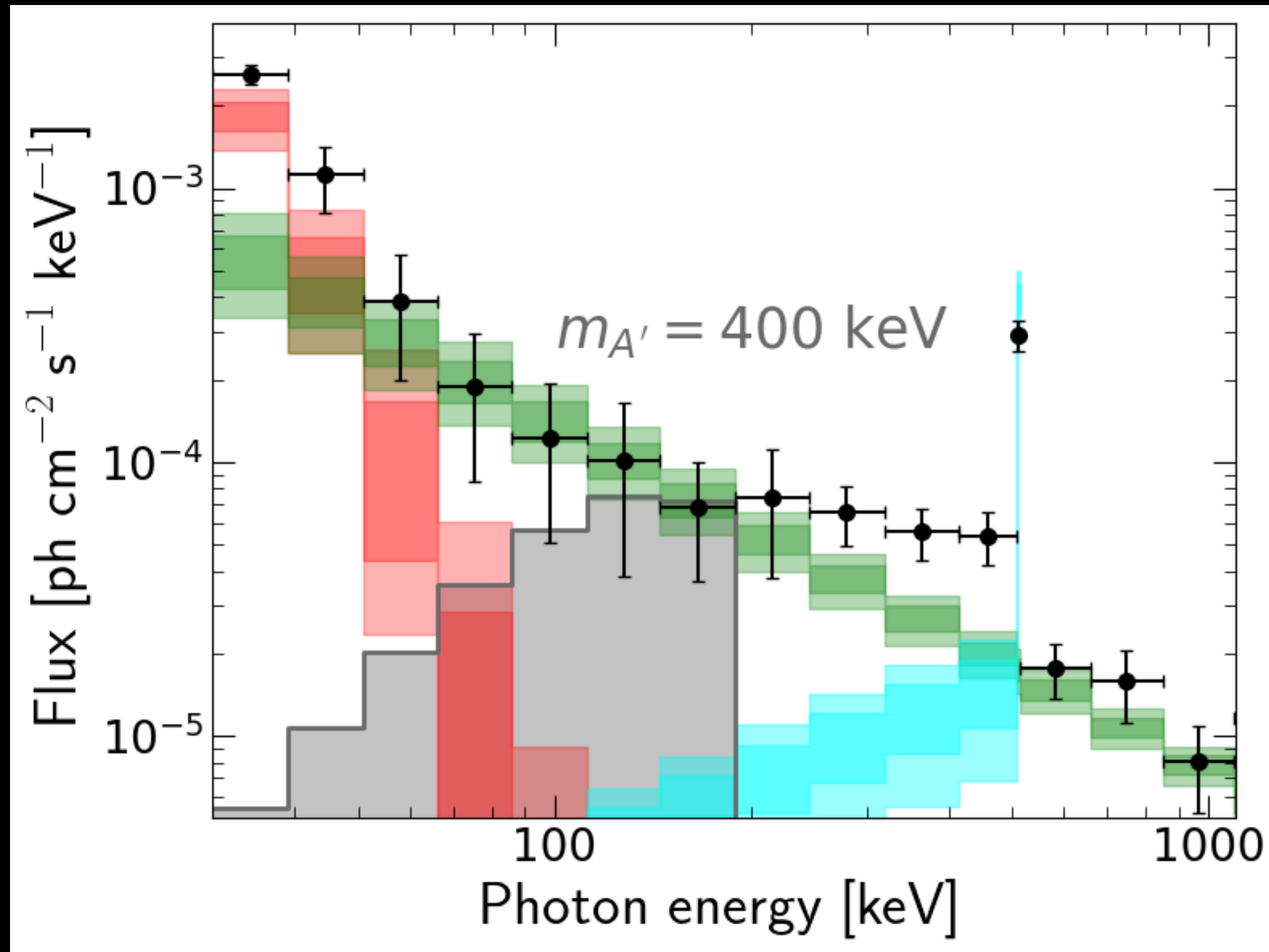
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# INTEGRAL/SPI 16 years-data



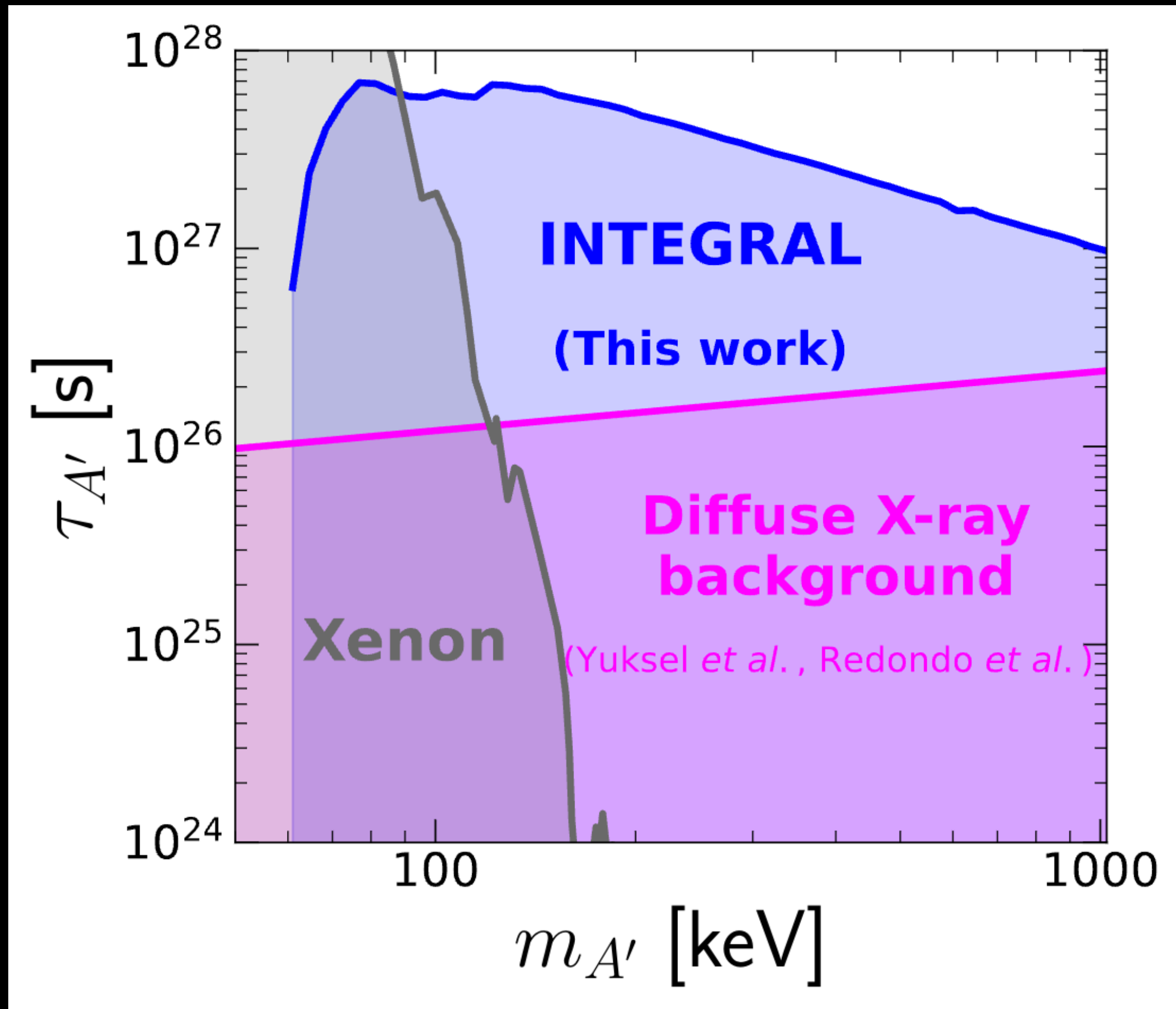
- **Unresolved Sources**
- **Inverse Compton Scattering**
- **Positronium decay**

**Tool:** 3ML (1507.08343)

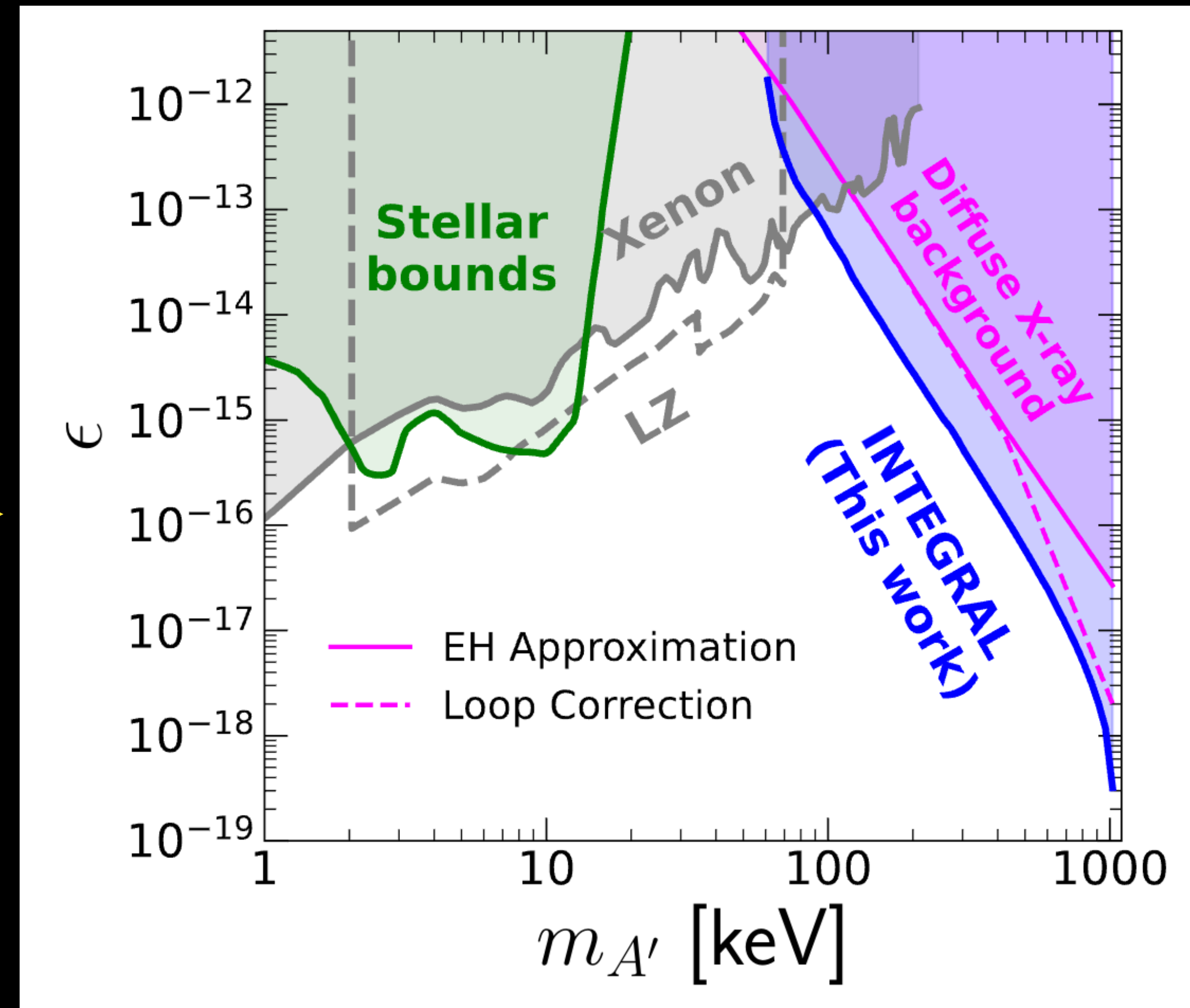
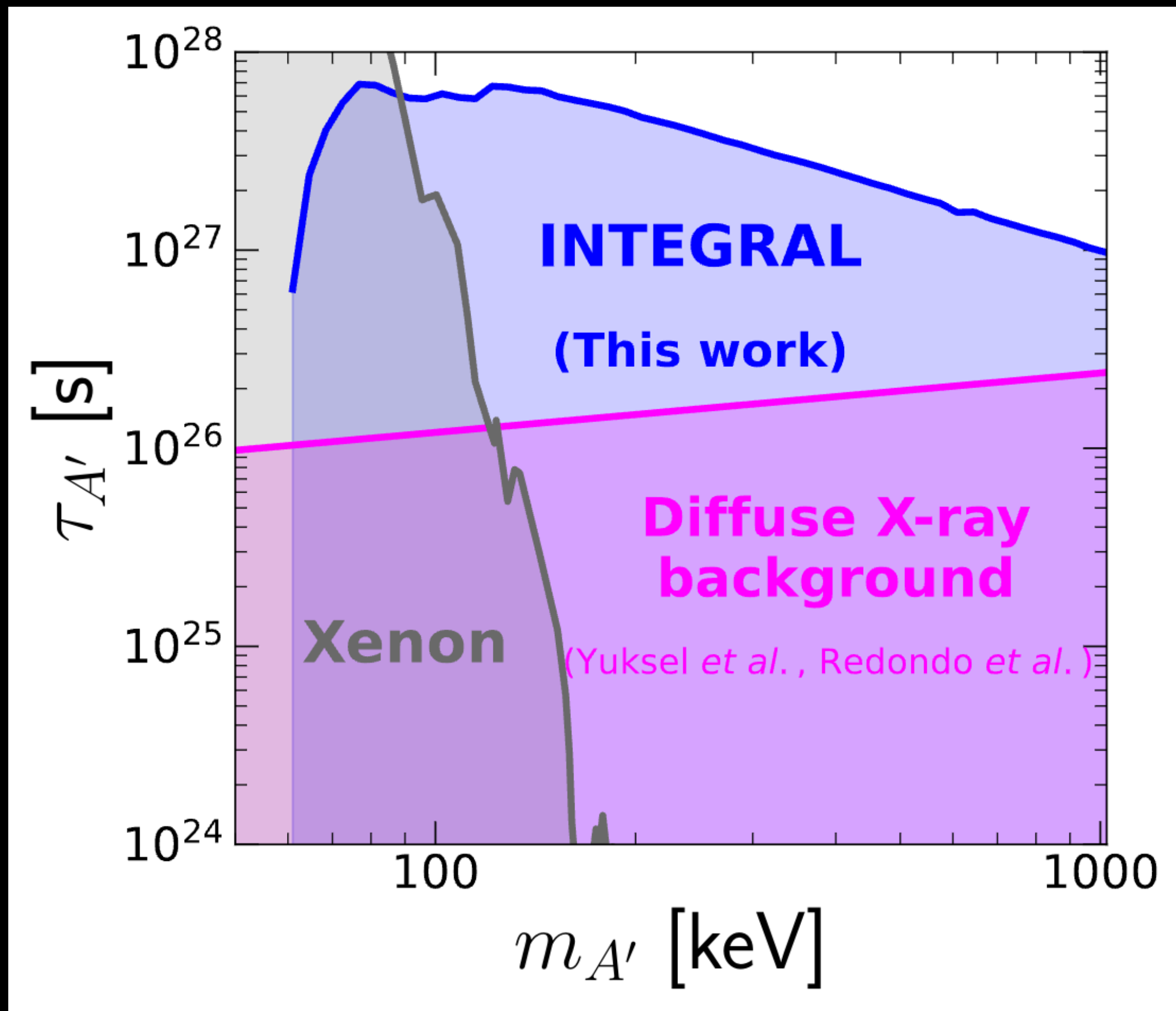
**Template:** Thomas Siegert, Francesca Calore, and collaborators (2209.06299, 2202.07483)

# New Constraints on the Dark Photon

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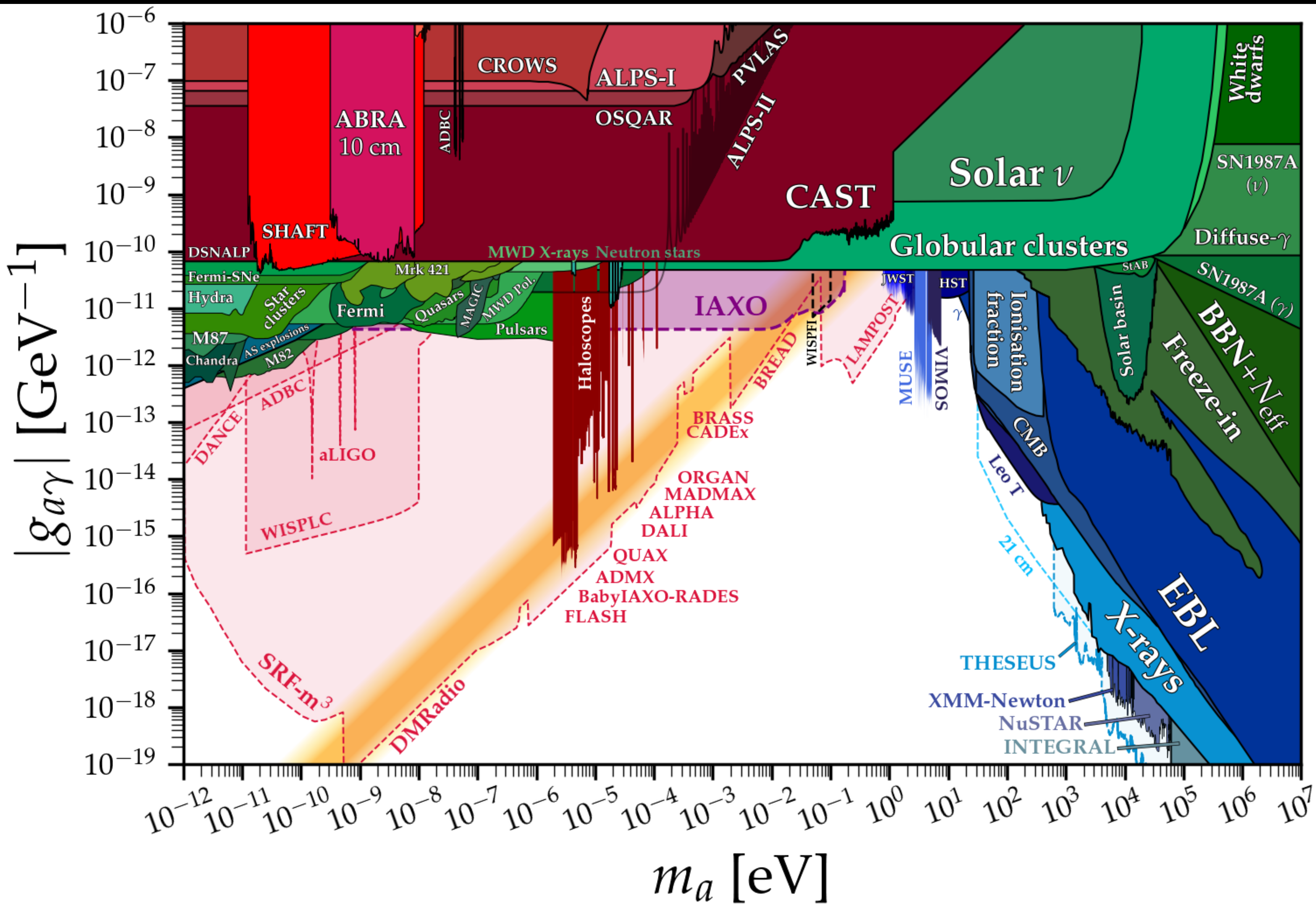


# New Constraints on the Dark Photon



**What next?**





A man in a blue plaid shirt is looking at a woman in a red dress in a city street. The woman is smiling and looking towards the camera. The man is looking at her with a slight smile. The background is a blurred city street with other people and buildings.

**Dark Photon**

**X-ray dude**

**Axion**

Thank you for listening!

Chiao is searching  
for Dog-matter  
too!

