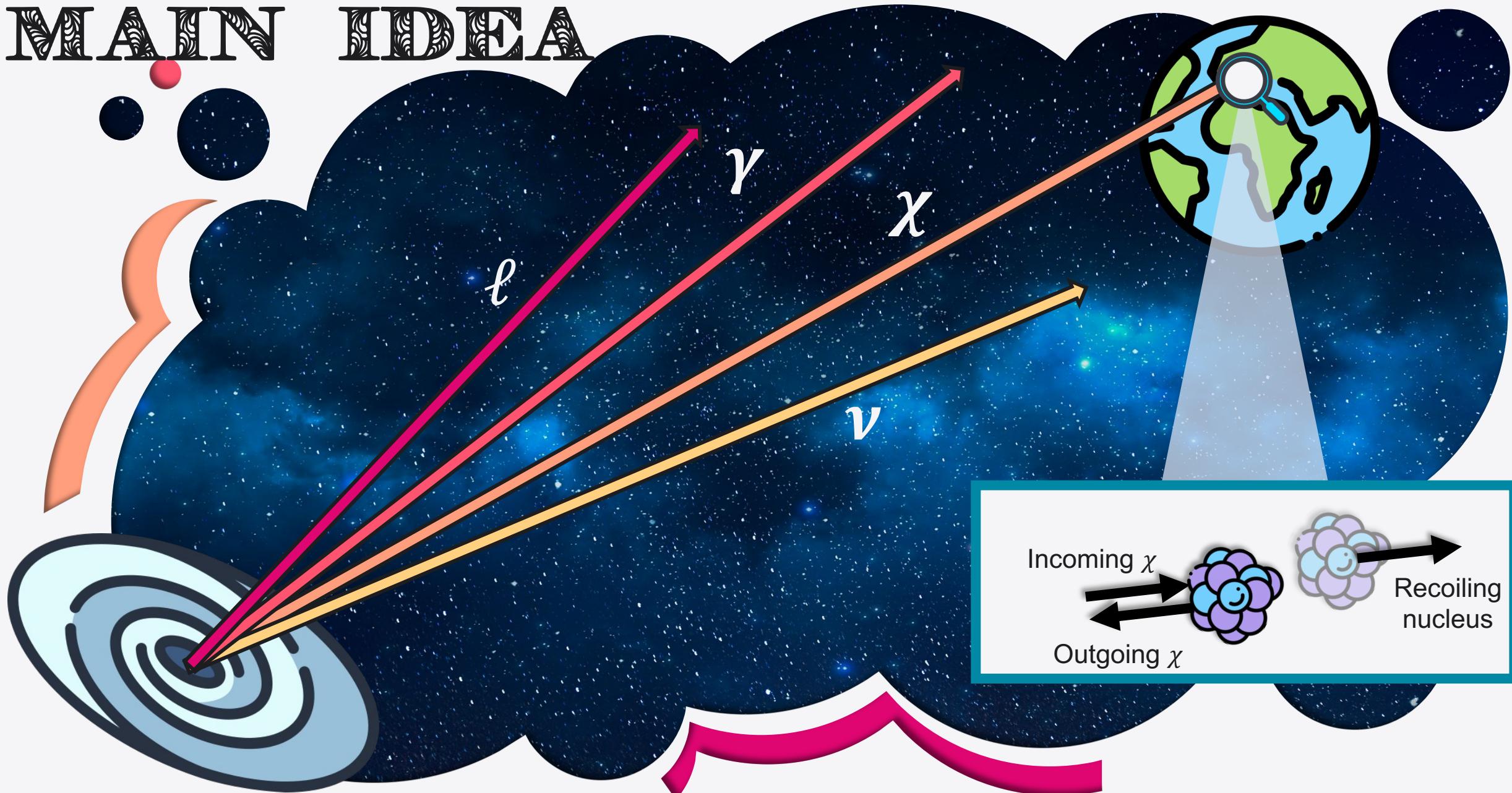


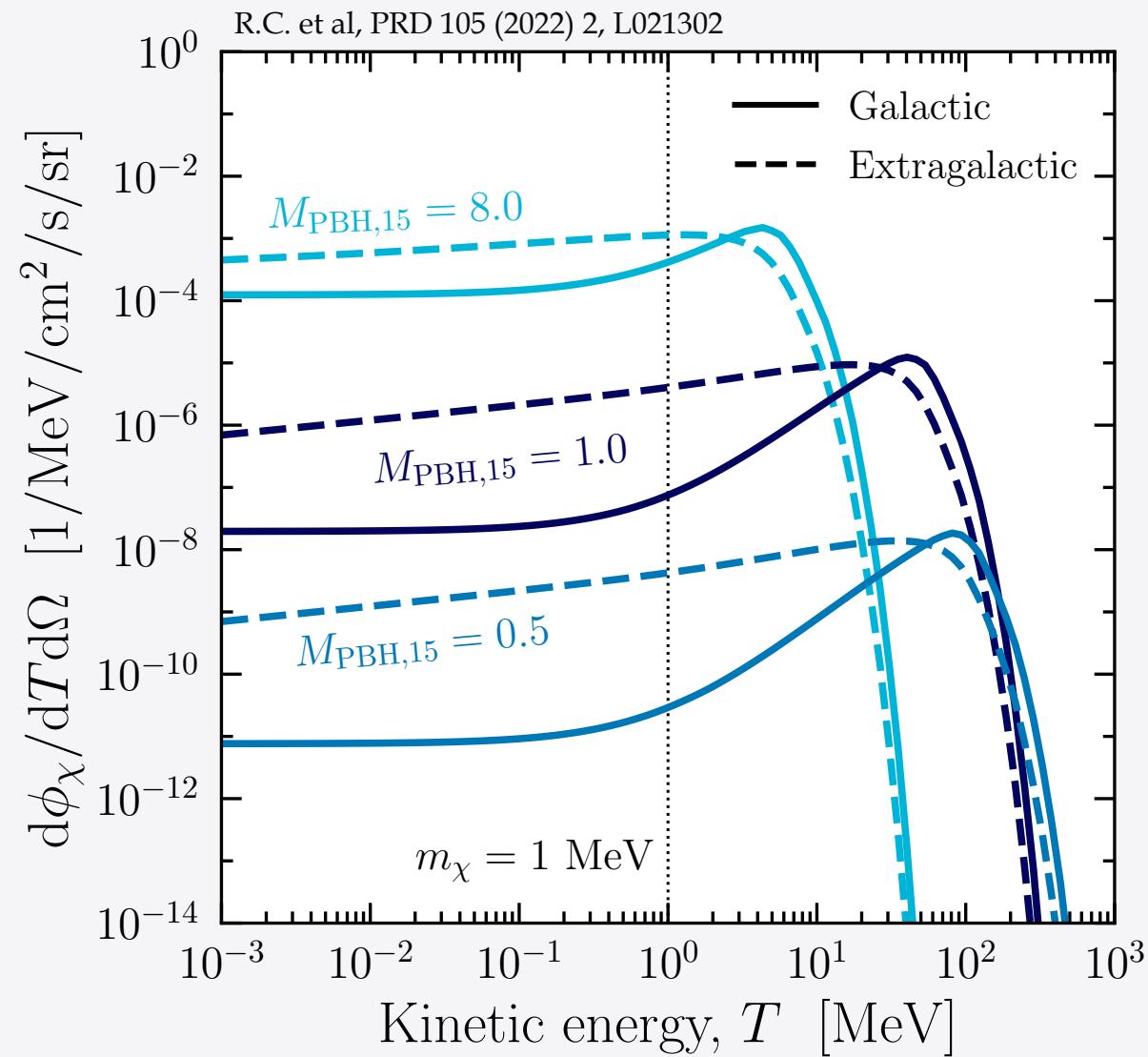
# **DIRECT DETECTION OF LIGHT DARK MATTER FROM EVAPORATING PRIMORDIAL BLACK HOLES**

**IN COLLABORATION WITH:**  
**M. CHIANESE, D. F. G. FIORILLO, N. SAVIANO**  
**BASED ON:**  
**PHYSICAL REVIEW D 105 (2022) 2, L021302 and**  
**PHYSICAL REVIEW D 105 (2022) 10, 103024**

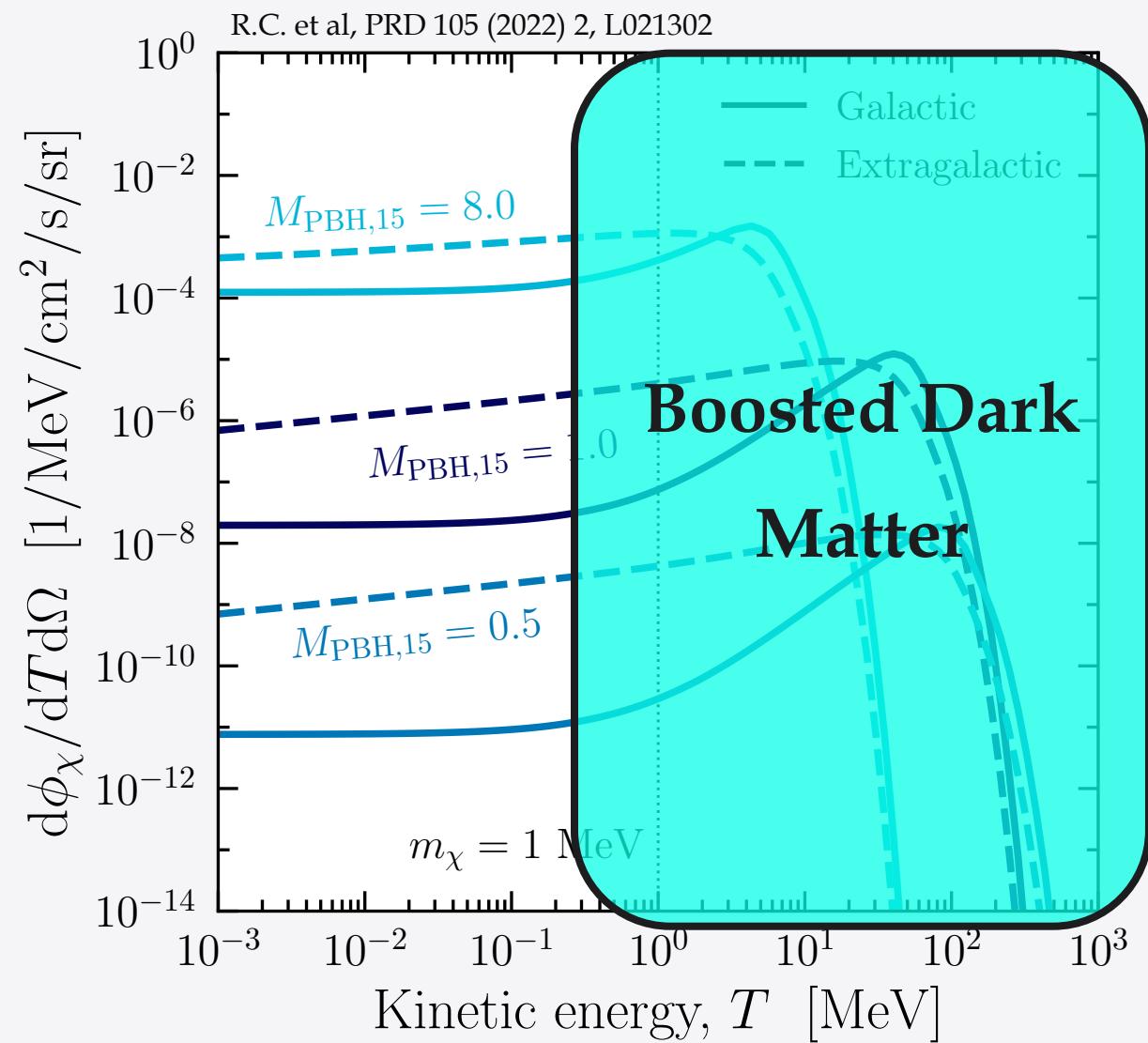
# MAIN IDEA



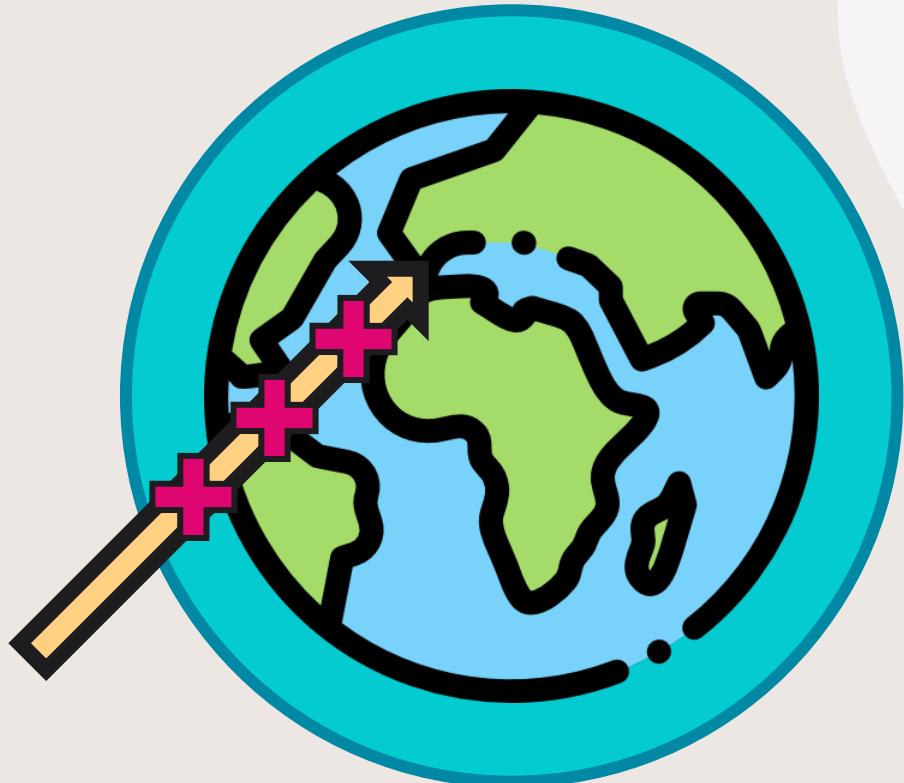
# DM FLUX FROM PBHIS



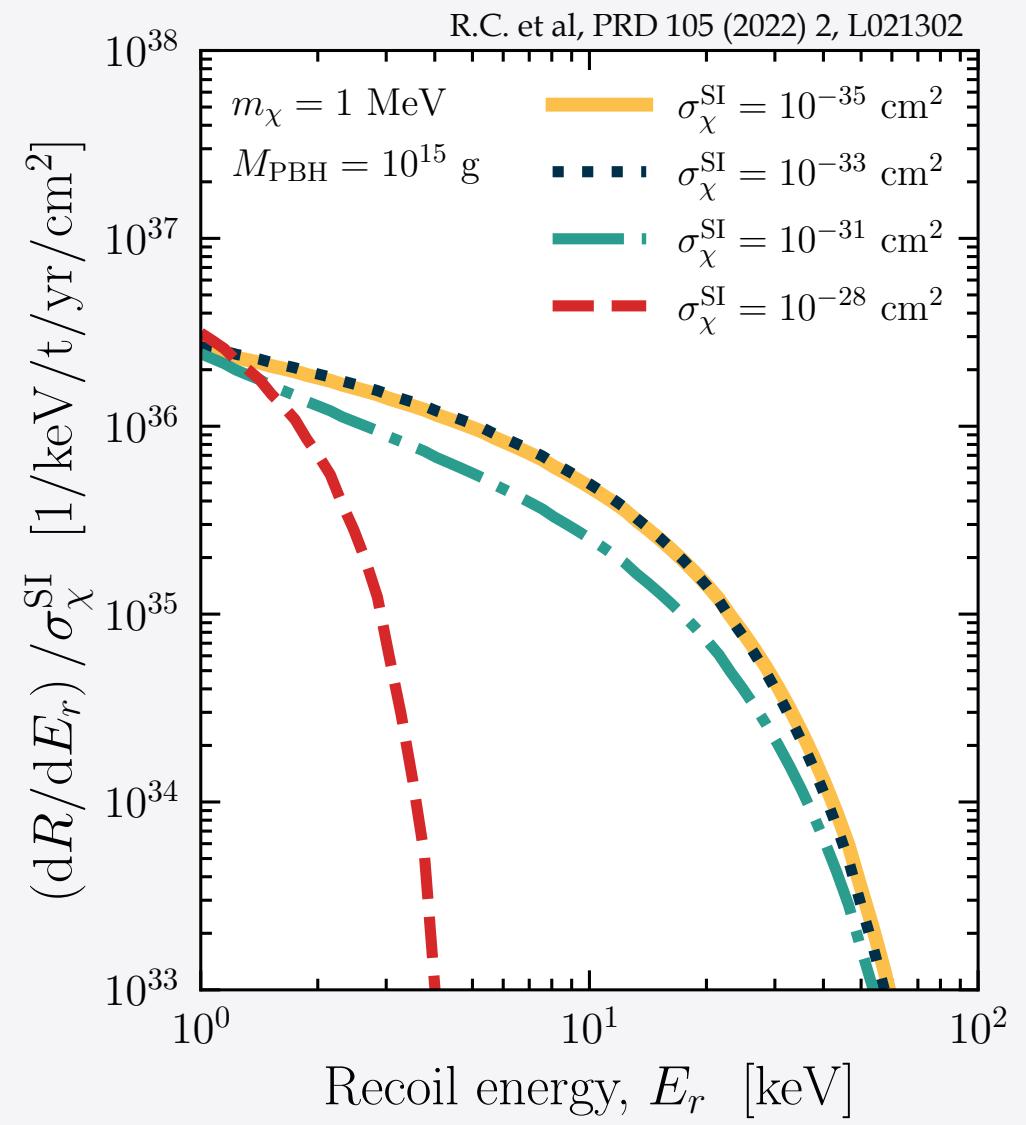
# DM FLUX FROM PBHIS



# EVENT RATE



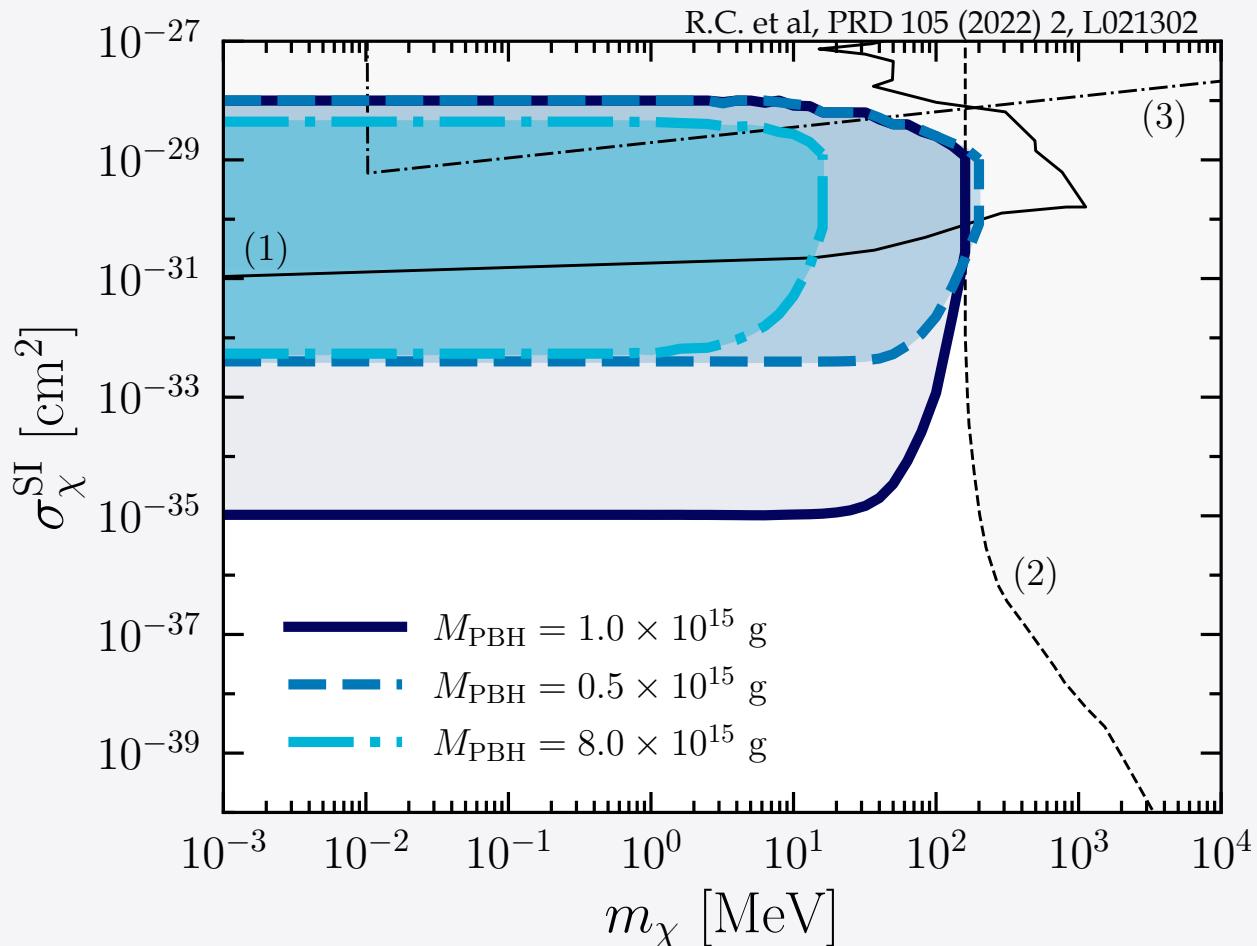
Propagation effects are relevant  
for cross-sections  $\gtrsim 10^{-31} \text{ cm}^2$



# CONSTRAINTS

$f_{PBH}$  maximum allowed by existing constraints

- (1) Cosmic Rays up-scatterings (T. Bringmann and M. Pospelov, PRL 2019; Christopher Cappiello and John F. Beacom, PRD 2019);
- (2) CRESST experiment (G. Angloher et al, EPJC 2017; A. H. Abdelhameed et al, PRD 2019);
- (3) Cosmology (V. Gluscevic and K. K. Boddy, PRL 2018; W. L. Xu et al, PRD 2018; T. R. Slatyer and C. L. Wu, PRD 2018; E. O. Nadler et al, AJL 2019).



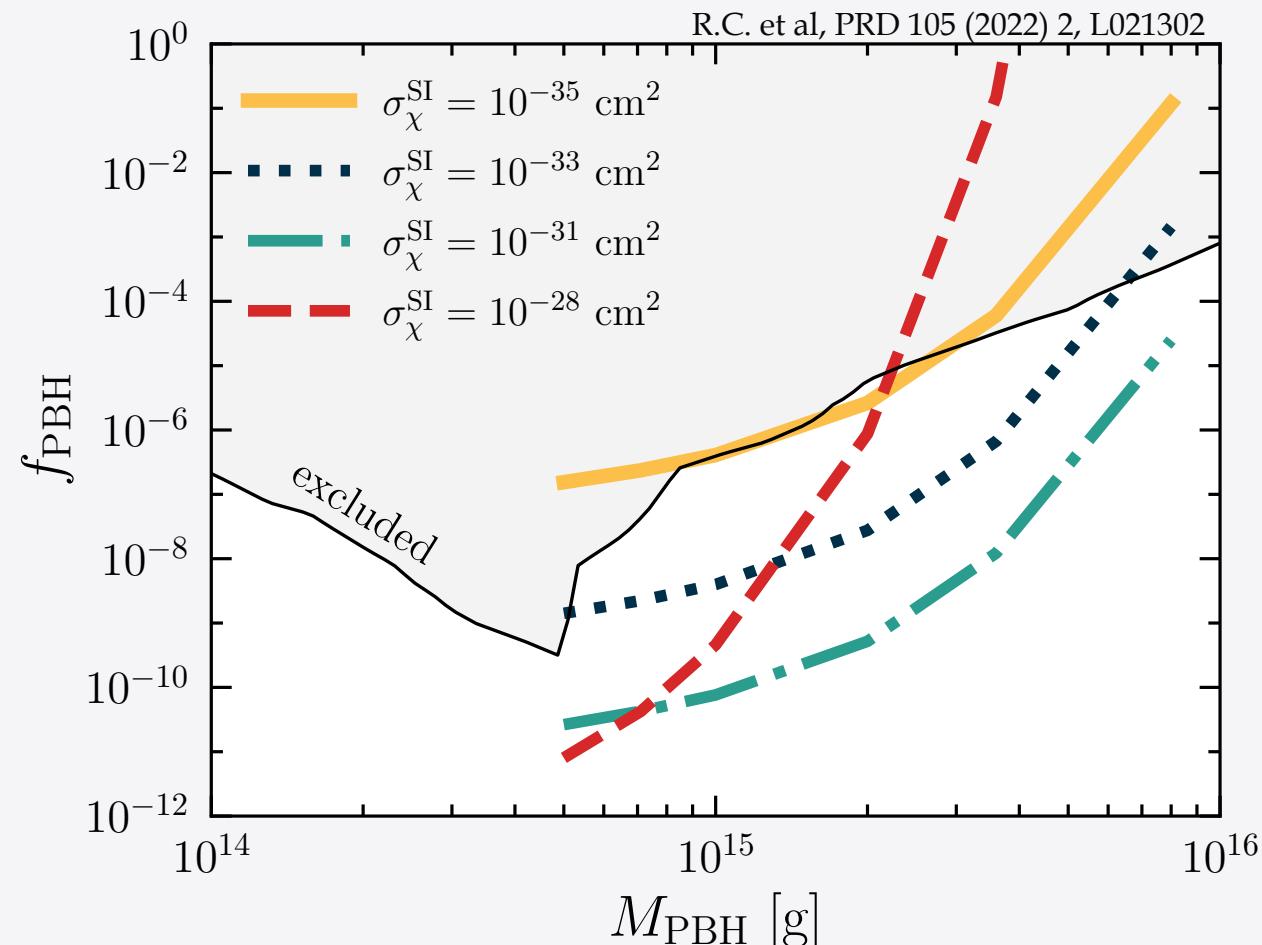
# CONSTRAINTS

Assuming the existence of  $\chi$ , we constrain

Primordial Black Holes abundance.

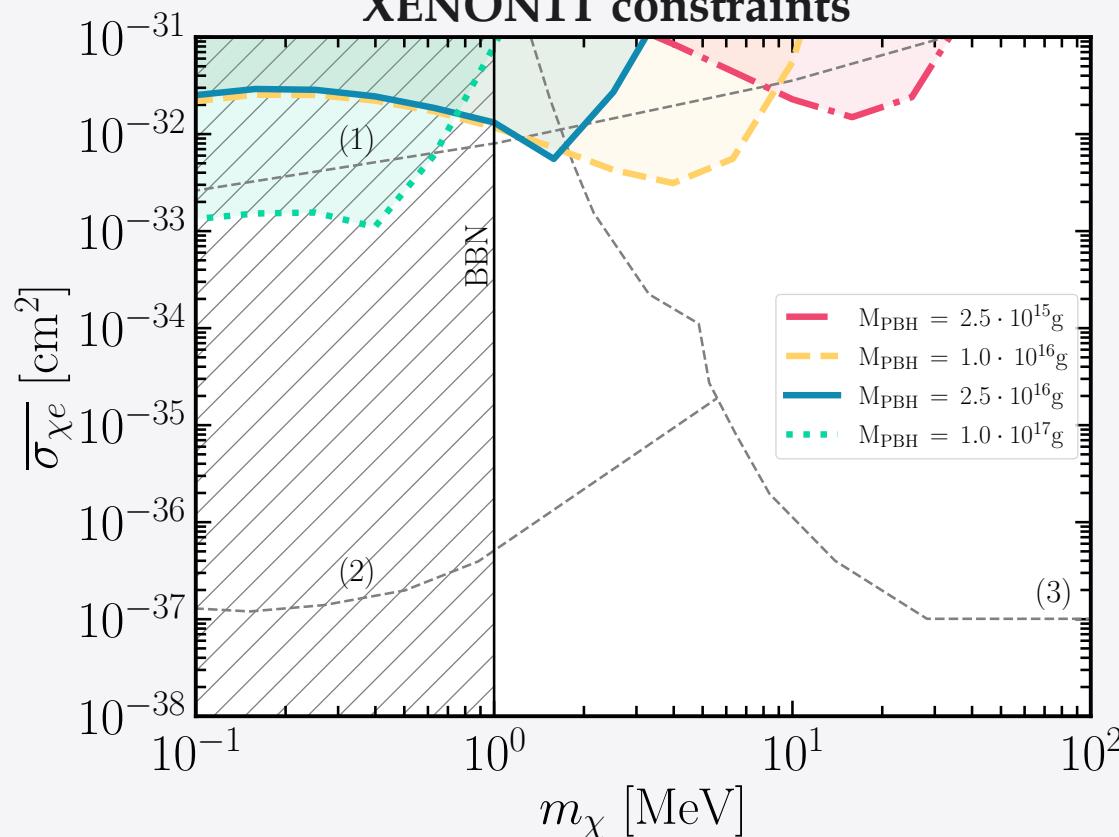
1. Valid for any light fermionic DM
2. Almost independent of  $m_\chi$
3. Propagation relevant for  $\sigma_\chi^{\text{SI}} \gtrsim 10^{-31} \text{ cm}^2$

Grey region: B. Carr et al, Rept.Prog.Phys. 84 21) 11, 116902



# $e - \chi$ INTERACTION

XENON1T constraints

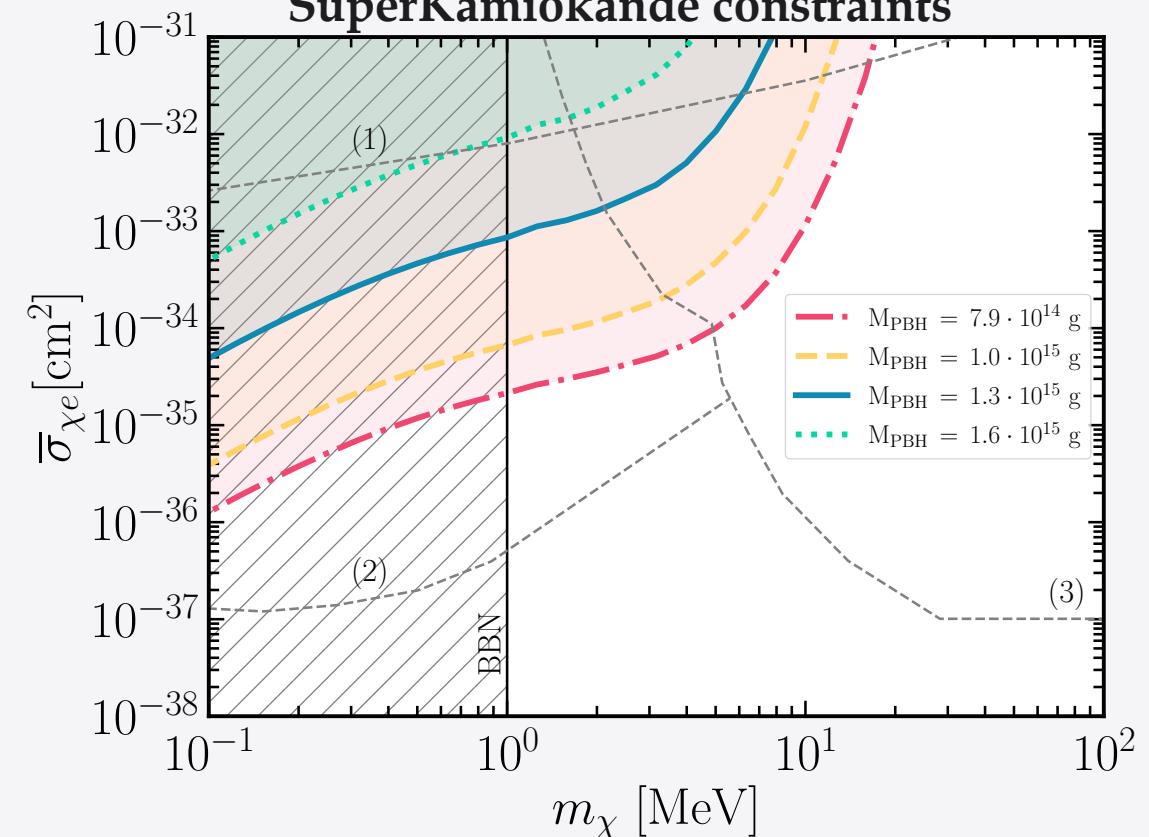


(1) boosted dark matter from cosmic-ray up-scatterings (C.

Cappiello and J. Beacom, PRD 2019)

(2) Solar reflection with XENON1T (H. An et al, PRL 2018)

SuperKamiokande constraints



(3) combined constraints from direct detection experiments  
(C. Cappiello and J. Beacom, PRD 2019)

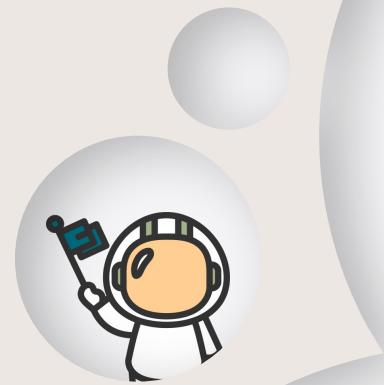
BBN: Big Bang Nucleosynthesis constraints (B. Henning and H.  
Murayama, arXiv:1205.647 )

R.C. et al, PRD 105 (2022) 10, 103024

# CONCLUSIONS

## ★ Primordial Black Holes as source of Boosted light Dark Matter

- ★ We calculate the expected event rate in XENON1T including attenuation effects
- ★ We obtain constraints on  $\sigma_{\chi Xe}^{SI}$  assuming Primordial Black Holes existence
- ★ We obtain constraints on  $f_{PBH}$  assuming  $\chi$  existence



*Thank you for  
your attention!*