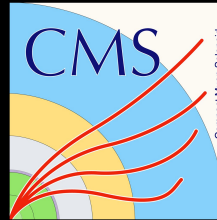


# LHC Dark Matter Working Group activities: Introduction

Deborah Pinna, Sukanya Sinha, Tim Tait,  
Titus Mombaecher, Uli Haisch

LHC BSM WG general meeting  
12 November 2025



## → Long history: first open meeting of the LHC Dark Matter WG in 2015

- WG activity built on the experience of previous ATLAS-CMS Dark Matter Forum
- Main goal: prioritized list of benchmark models for collider searches, including parameter scans and promoting theory-experiment cross-collaboration
- Community: Main mailing list has over 200 members spanning across experimental and theory front

## → Cross-experiments effort

- CMS, ATLAS, LHCb and theory community
- coordinates: benchmark models, recommendations for result presentation, discuss complementarity with other DM experiments

## → General

- documents: <https://lpsc.web.cern.ch/content/dark-matter-wg-documents>
- meetings: <https://indico.cern.ch/category/7246/>
- website: <https://lpsc.web.cern.ch/content/lhc-dm-wg>
- stay up-to-date: [mailing list announcements](#), [mailing list technical](#)

### LHC DM WG organisers

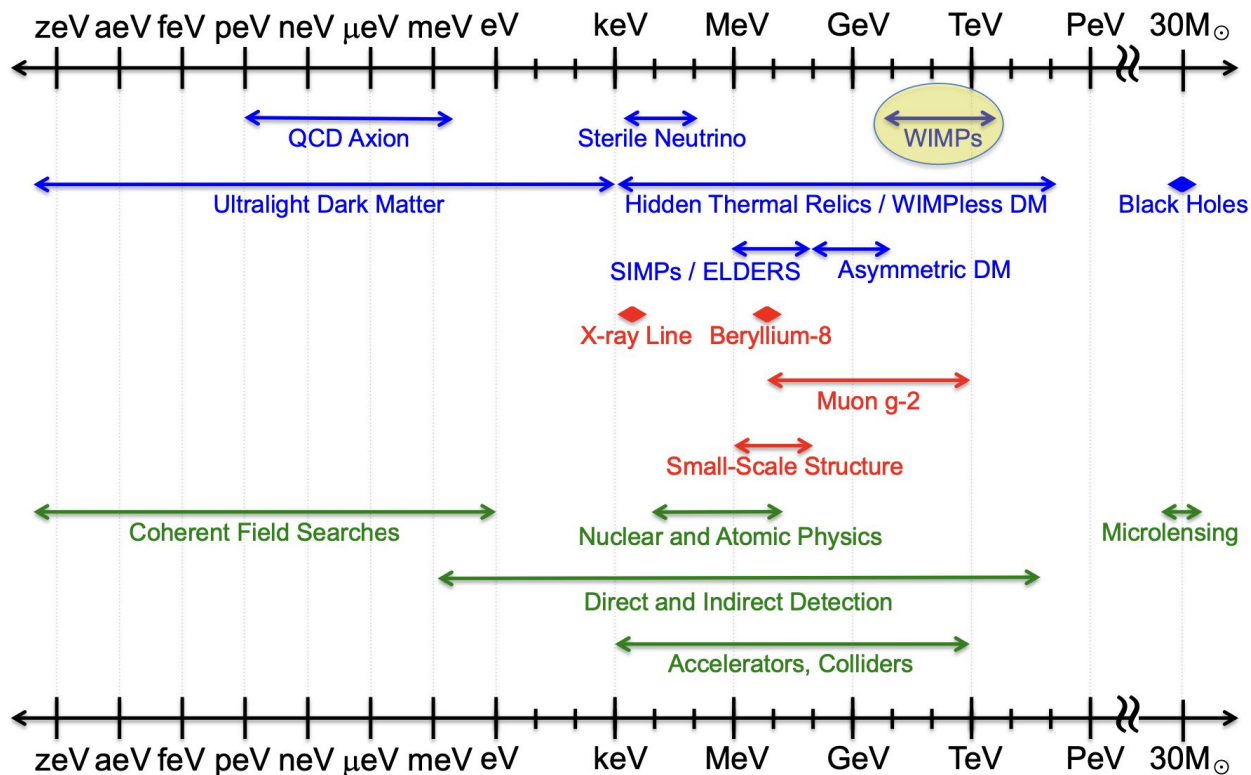
- ATLAS: Sukanya Sinha
- CMS: Deborah Pinna
- LHCb: Titus Mombaecher
- Theory: Uli Haisch and Tim Tait
- LPMC: Michelangelo Mangano

*Contact us!*

# How can we study DM interactions with SM?

→ Very large set of possible DM masses can account for observed final relic density

→ Over the next decade:



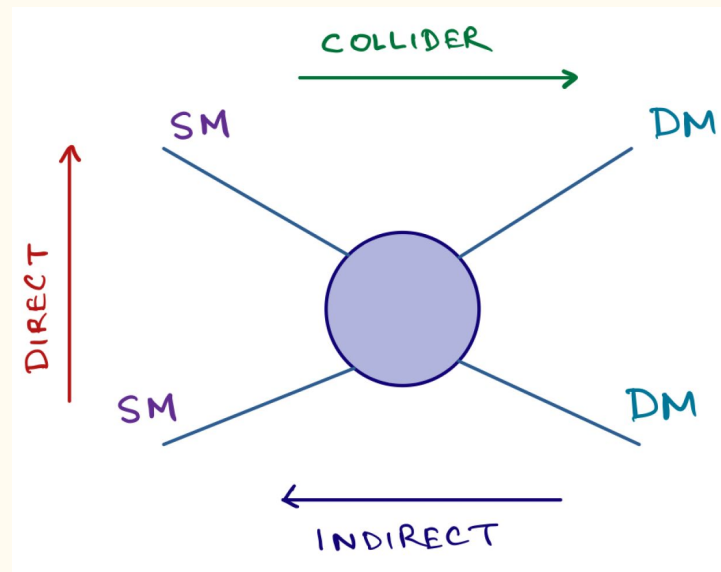
Many compelling models accessible via planned/proposed experiments, colliders, and observatories across experimental frontiers  
 → **understanding and harnessing complementarity between techniques and technologies is essential**

# How can we study DM interactions with SM?

- Very large set of possible DM masses can account for observed final relic density
- Over the next decade: Necessity of unified strategy to maximize discovery potential

Multiple observations, experiments and coherent theories are needed for DM discovery

- Observations motivating DM arise from astrophysics & cosmic probes
- Theoretical frameworks are crucial to put different observations into context
- **Direct Detection** → can discover DM with cosmological origin
- **Indirect Detection** → can probe decays of cosmological DM into SM particles
- **Colliders / accelerators** → can produce DM and probe its dark interactions



**If DM not found?** We will still gain important information on its properties!

## Completed and ongoing DMWG projects

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<i>Topics</i>	<i>Expected Timeline</i>
2HDM+a Run3 benchmarks	kick-off in October 2024, Call of expression of interest in taskforce: <b>today!</b>
s-channel model benchmarking update	Updates <b>today!</b>
t-channel model benchmarking	Updates <b>today!</b>
Dark Higgs Run3 benchmarks	Discussions to be initiated. <b>If you are interested, please reach out!</b>
Dark showers (joint task force between DM, Prompt & LLP WG!)	Workshop report <a href="#">here</a> . First LHC wide effort, several studies planned, white-paper targeting <i>Spring 2026</i>
<i>Your new idea?</i>	...