

Dark Matter & Dark Sector discussion

The Dark Matter / Dark Sector PPG group
Discussion Leader: Caterina Doglioni (University of Manchester)



What to expect from this discussion session

Q1: What would it take to believe a DM discovery?

Q2: What would be the role of complementary experiments in case of a discovery from direct detection experiments?

What should the course of action be for colliders or accelerator(-adjacent) searches?

Q3: How seriously should we take the models and benchmarks on the market (in terms of search targets and exclusions), given their assumptions?

Q4: Beyond sensitivities, what should the metrics be for evaluating the merits of a diverse dark matter search programme in Europe and at CERN?

Q5: The previous Strategy suggested to work in synergy across communities. Should we coordinate further across experiments and theory?

Q6: Are we only looking under lampposts? What should be the strategy towards uncharted territory in Dark Matter and Dark Sector?

Instructions and logistics

- Help us follow the discussion in person:
 - Stand up if you want to ask a question (for visibility)
 - Talk to others as you'd like them to talk to ~~you~~ your friends and family
- Help others follow online:
 - Say your name and affiliation before asking a question
 - Wait for the microphone so you can be heard

[EPPSU Code Of Conduct](#)

Q1: What would it take to believe a DM discovery?

What if a collider experiment found an excess first,
how would we prove it's dark matter?

Q2: What would be the role of complementary experiments in case of a discovery from direct detection experiments?

What should the course of action be for colliders or accelerator(-adjacent) searches?

Q3: How seriously should we take the models and benchmarks on the market (in terms of search targets and exclusions), given their assumptions?

Are we doing enough in terms of DM theories and candidates?

Q4: Beyond sensitivities, what should the metrics be for evaluating the merits of a diverse dark matter search programme in Europe and at CERN?

Example: what is the right mix of small-scale vs. large-scale projects in Dark Matter and Dark Sector?

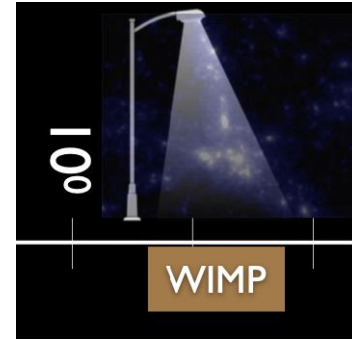
Q5: The previous Strategy suggested to work in synergy across communities. Should we coordinate further across experiments and theory?

Outlook on synergies: Focusing on the quest for DM in the coming decades, at the Granada Symposium there was consensus in further developing synergies between the efforts of the high energy physics and astrophysics communities. The discussion highlighted the need for enhanced communication between accelerator/collider-based, direct detection and indirect detection dark sector searches, as well as the potential benefits of common technology platforms (see Chapter 11).

Consensus on common search targets is important for a joint interpretation of results from different searches, and will be of fundamental importance to validate a putative DM discovery in different experiments and channels. This can be facilitated by the existing LHC Dark Matter and Physics Beyond Collider working groups, and the newly established EuCAPT Astroparticle Theory Center as a joint venture of ECFA and APPEC, as well as by further discussions among the many experts in the field.

[Deliberation Document on the 2020 update of the European Strategy for Particle Physics](#)

Does the community feel like the current DM-focused initiatives ([Dark Matter Group in the LPCC BSM Working Group](#), [Long Lived Particle Group in the LPCC BSM WG](#), [Physics Beyond Colliders](#), [EuCAPT](#), [JENA iDMEu](#)...) are enough to collaborate as per previous recommendation?



Q6: Are we only looking under lampposts?
What should be the strategy towards uncharted
territory in Dark Matter and Dark Sector?

Are we too narrow?

Can/should dark matter searches be more “model independent”?