CF03: Cosmic Probes of Dark Matter Physics

Our Plan for White Papers

SnowMass2021

November 30, 2020

Outline

- Solicited white papers, facilitators & Slack channels
- White papers with CF03 contributions
- Timeline
- Guidance/Suggestions to the facilitators
- Survey results from potential contributors/writers
- Discussion on organization challenges and others

CF3 "Solicited" White Paper Topics

- **Dark matter physics from halo measurements** [#wp-cf03-dark_matter_halos]
  Dark matter physics from dark matter halos ranging from large-scale structure to sub-galactic scales.
  Facilitators: **Francis-Yan Cyr-Racin, Keith Bechtol, Katelin Schutz, Simon Birrer**

- **Primordial Black Holes & Gravitational Waves** [#wp-cf03-dark_matter_pbh_gw]
  Primordial black holes as dark matter and probes of inflation (joint with CF7?)
  Facilitators: **Will Dawson, [talking to CF7]...**

- **Numerical simulations and systematics** [#wp-cf03-dark_matter_sims]
  Importance of numerical simulations for extracting dark matter physics (joint with CompF2?)
  Facilitators: **Annika Peter, Ferah Munshi, Arka Banerjee**

- **Connecting dark matter to early universe physics** [#wp-cf03-dark_matter_early_universe]
  Light relics, 21cm (EDGES), etc. (joint with CF5 & TF9?)
  Facilitators: **TBD...**

- **Dark matter physics in extreme astrophysical environments** [#wp-cf03-dark_matter_xtreme]
  Includes stellar interiors, neutron stars, non-primordial black holes (joint with TF9?)
  Facilitators: **Djuna Croon, Kerstin Perez, Regina Caputo, Masha Baryakhtar**

- **Facilities for cosmic probes of dark matter physics** [#wp-cf03-dark_matter_facilities]
  Proposed facilities for cosmic probes of dark matter including MSE, MegaMapper, CMB-HD, etc.
  Facilitators: **Ting Li, Josh Simon, Sukanya Chakrabarti, Neelima Seghal**

White Papers with CF3 Contributions

- Led by TF09
  - Data Driven Cosmology: Raphael Flauger, Marilena LoVerde, Annika Peter, Mark Vogelsberger, and Risa Wechsler [#tf09_topic_2_data_driven_cosmology]
  - Early Universe Model-Building (with TF08): David Curtin, Eric Kuflik, Yonit Hochberg, Neal Weiner, and Keisuke Harigaya [#tf09_topic_3_early_universe_model_building]
- Led by TF10
  - Theory and complementarity (led by CPM #150 through #cpm_topic_150)
- Led by CF01
  - The landscape of cosmic-ray and high-energy photon probes of particle dark matter
    Facilitators: ???
  - Puzzling excesses and how we can resolve their origin/existence (small-scale structure issues, H0 tension, Galactic center gamma-ray excess...) (with CF1 related to CPM #139)
    Facilitators: ???
  - Synergies between DM searches and multiwavelength/multimessenger astrophysics / understanding astrophysical backgrounds (led by CF1, with input from CF3 & CF7)
    Facilitators: Kerstin Perez, …
  - Ultraheavy particle dark matter / probing the heaviest particle dark matter candidates (led by CF1, input from CF7?)
    Facilitators: ???
- Led by IF02
  - Instrumentation for future facilities (led by IF2 through CPM #69)
- Led by CF06
  - ~~Optical/NIR survey facilities?~~ (discussion in CF6 through CPM #144; current proposal is to directly include in CF6 report without white papers #cf06-dark_energy_comp)
  - Statement on DOE's aversion to building telescopes (joint with CF4 & CF6?)
- Diversity & Inclusion in (cosmic frontier | cosmic probes of dark matter | dark matter | ...)

White Paper Timeline

Proposed timeline for paper writing:
- Mid-November 2020: identify "solicited" white papers and "facilitators"
- End of January 2021 (ideally end of 2020, but we know 2020 is weird): White paper outlines/skeletons -- what will the paper cover, begin to articulate key questions and opportunities
- March 2021: topical conveners identify to CF conveners key questions and opportunities
- March 2021: first draft of white paper to CF03 conveners, for feedback and discussion; reminder, topical group report is written in parallel to white papers (so need to know early)
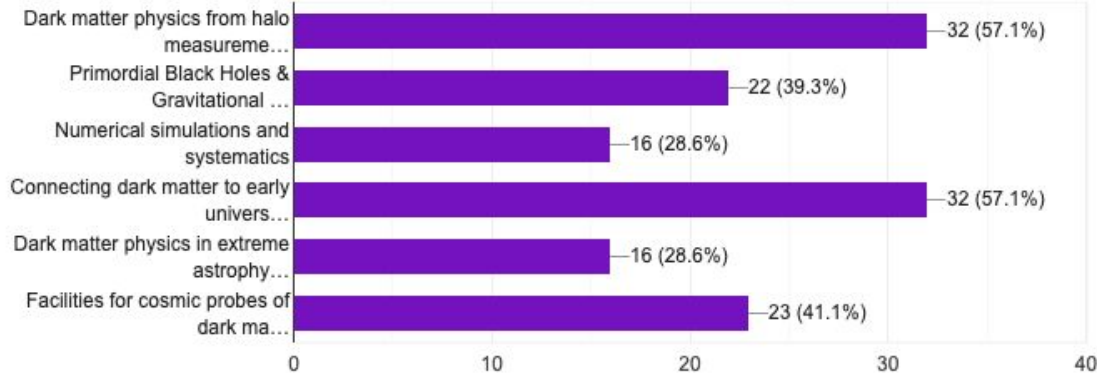- May 2021: final draft of white paper to Snowmass

Goals as Facilitators

- Ensure that the interests of the community are expressed (reflecting contributions to the LOIs, community meetings, Slack conversations, etc.)
- Contact LOI writers and help incorporate LOI content into white papers
- Further solicit participation/input from a broad range of community members
- Help provide updates on white paper progress to the broader CF3 group
- Develop the framework/message of white papers based around "**key questions**" and "**key opportunities**" as put forth by the community
- Contribute, edit, and finalize white paper content
- Help us synergize white paper content into the CF3 topical group report

CF3 White Paper Participation Survey

Check any of the solicited white papers that you would like to be involved in.

56 responses

Category	Value
Dark matter physics from halo measureme...	32 (57.1%)
Primordial Black Holes & Gravitational ...	22 (39.3%)
Numerical simulations and systematics	16 (28.6%)
Connecting dark matter to early univers...	32 (57.1%)
Dark matter physics in extreme astrophy...	16 (28.6%)
Facilities for cosmic probes of dark ma...	23 (41.1%)

- 56 Responses!
- We will try to add people to the relevant paper channels

Both facilitators and writers/contributors will have access to the file

https://docs.google.com/spreadsheets/d/1Lxiyr_dDK9km-armJdv-8AXlroRDK68A8guiACRw6nY/edit#gid=1804301380

Discussion
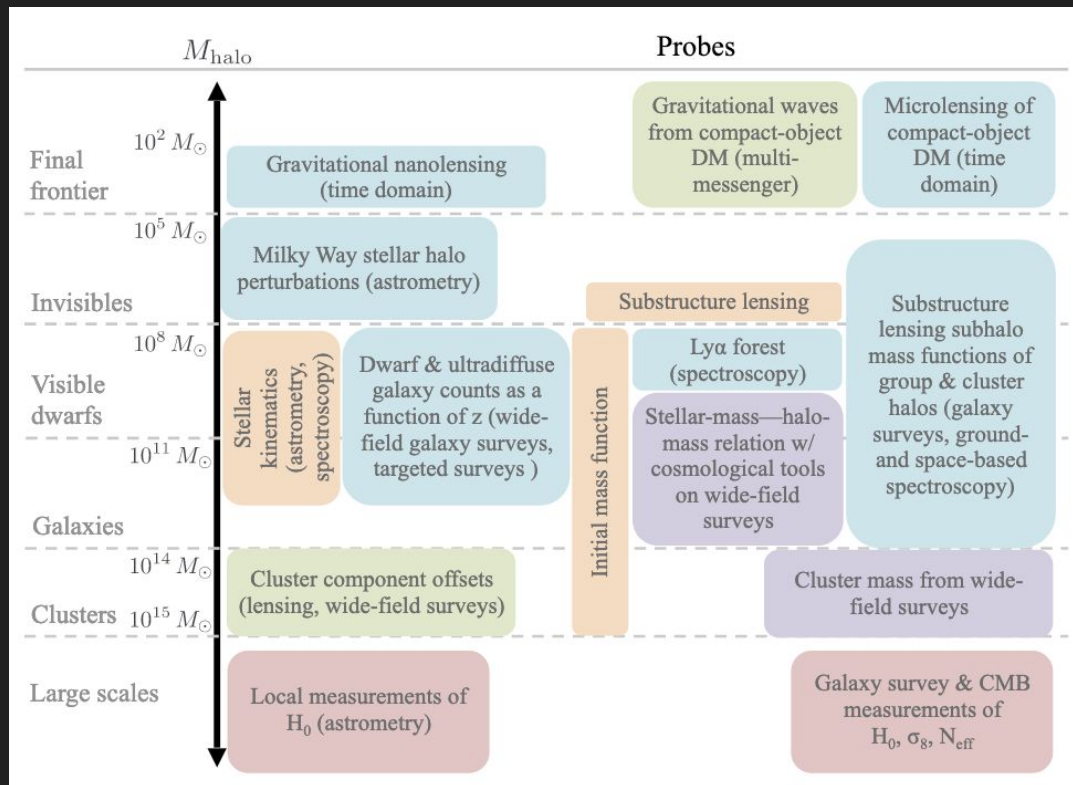
What is the most effective way to organize meetings?
Optimal frequency and time for meetings within the whole CF03 group, each white paper topical group, facilitators+conveners…

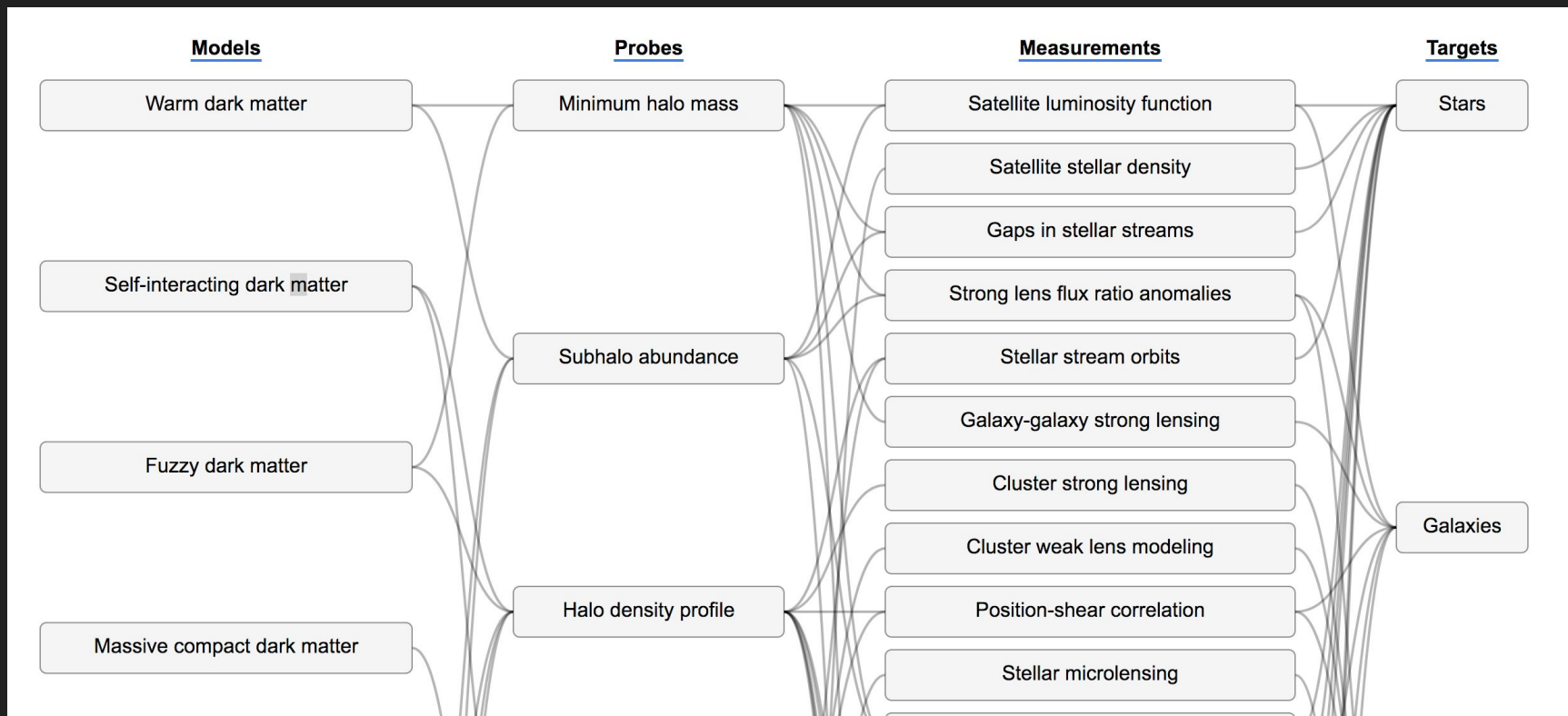Other organization challenges and issues we need to address?

Discussion

Think about the "money" plot from CF03!

Example

Think about the "money" plot from CF03!

https://lsstdarkmatter.github.io/dark-matter-graph/network.html

Example

Example