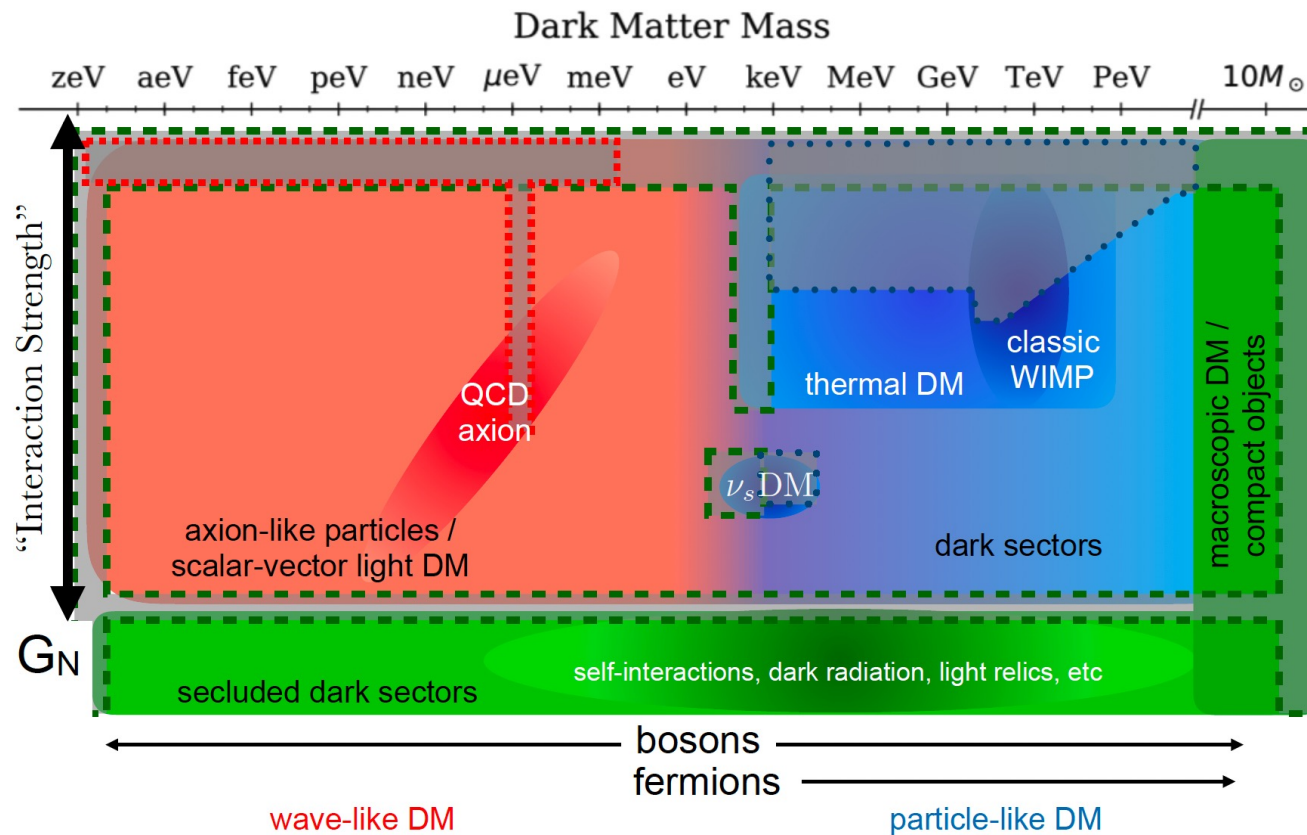


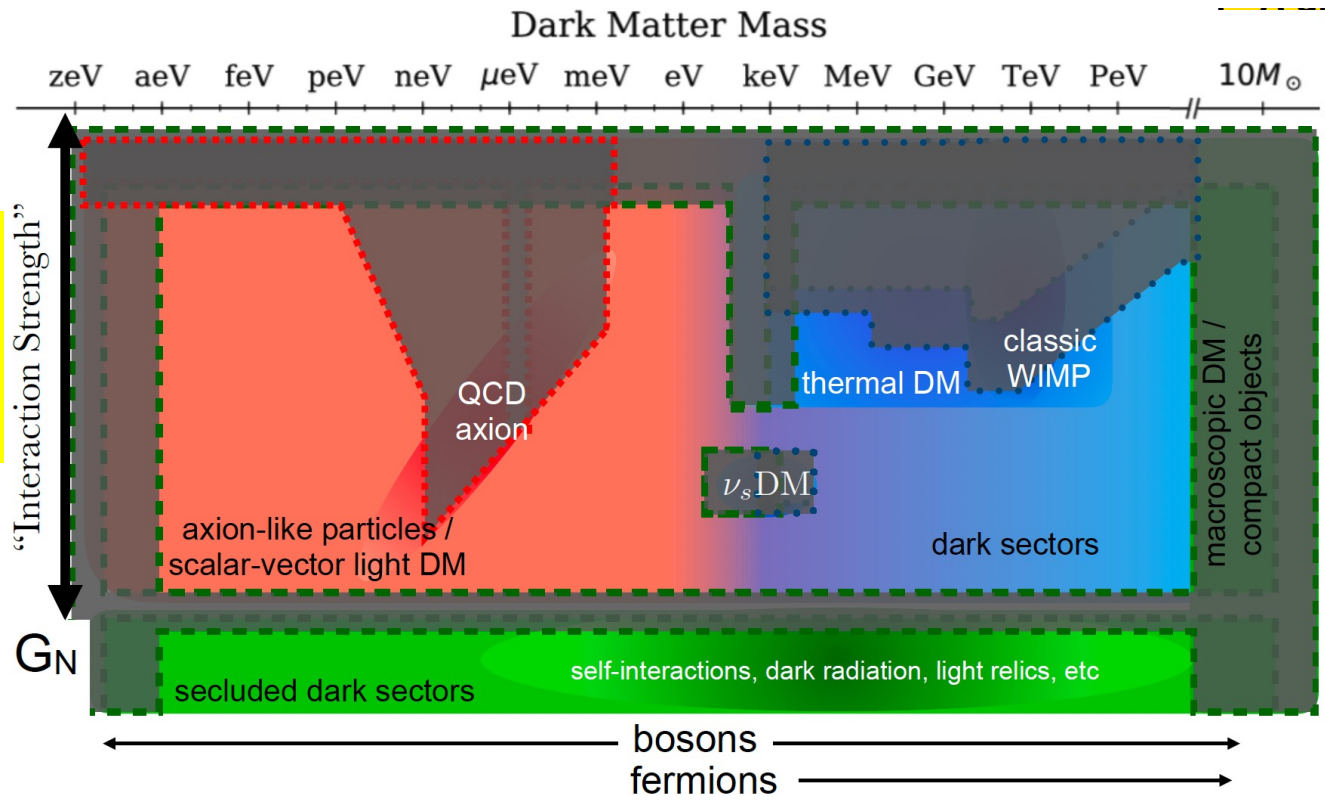
CF dark matter strategy

Captions Here



Delve deep, search wide

Captions Here



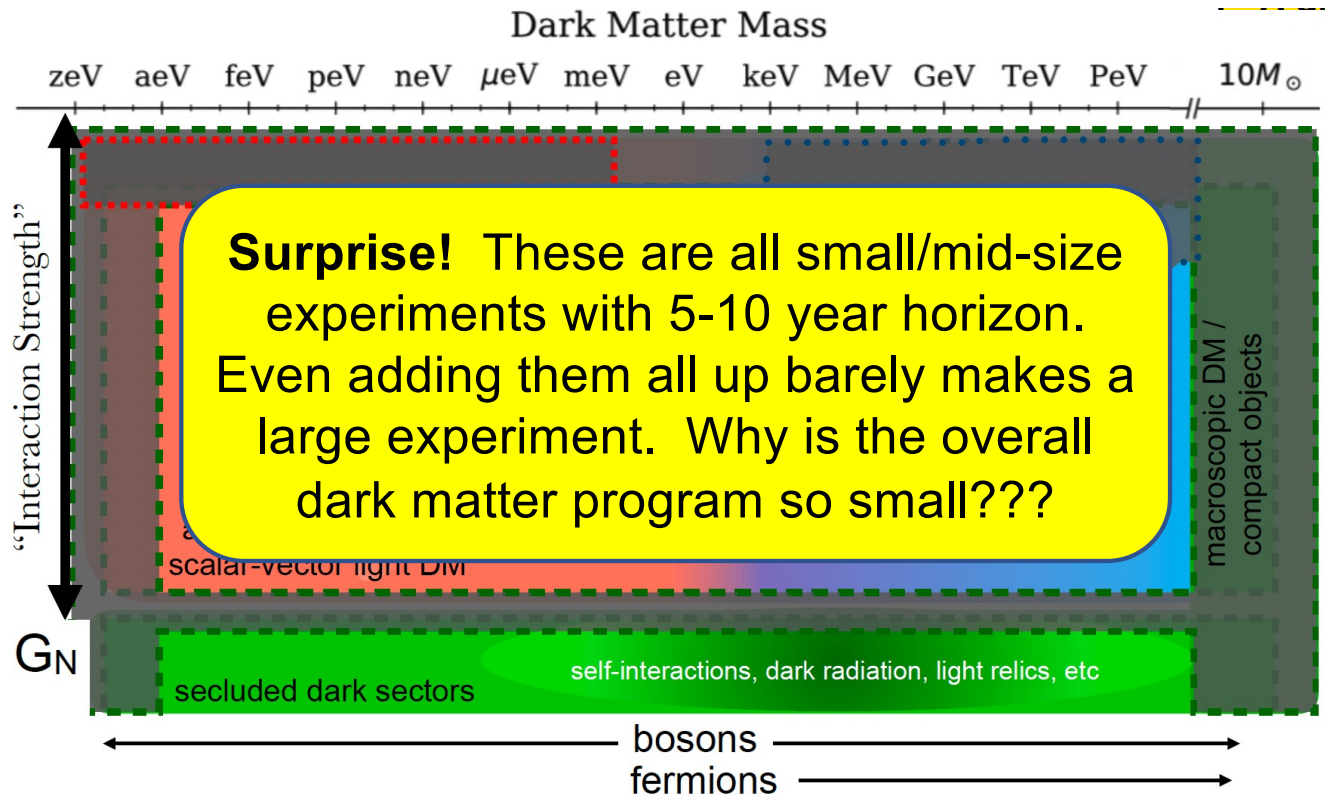
Deep coverage of high priority remaining **axion**, **WIMP** parameter space.

Significant inroads will be made into vastly expanded parameter space including new dark sector models.

Enabled by a versatile, wide-ranging program of complementary terrestrial, indirect, and cosmic probes

Delve deep, search wide

Captions Here



NB: for Cosmic Frontier, dark matter is **equally high priority science** as cosmic acceleration. Simply doesn't reach arbitrary \$500M threshold for CF talk on large projects.

Why is the overall U.S. dark matter program so small???

Is this not one of the clearest signs of BSM physics?

Captions Here

- Previously, scale was limited by mature technologies available to probe a well-motivated targeted model parameter space
- Now, theory-targeted DM parameter space has grown, and many new technologies are available including in national priorities like quantum sensing
- Tremendous opportunity to nurture this field and its workforce ... and make high-impact discoveries!
- **Valuable hardware training** for students at approachable scale → easy path to academia or lucrative instrumentation careers
- **Significant engagement from theorists** spawn innovative techniques
- **Cross-disciplinary collaborations** (AMO, CM, as well as astrophysics/astronomy) needed to harvest low hanging fruit – how to fund these efforts?

CF small/mid experiments menu targets a variety of science goals

Captions Here

Dark matter:

- Direct detection – next gen “large scale” WIMP detectors, next gen axion, broader program via dark matter new initiatives
- Indirect detection from the ground and from space, also DMNI?
- Cosmic (observational) probes

Cosmic collider, cosmic inflation, dark energy:

- Optical spectroscopy, e.g. DESI 2
- Line intensity mapping, e.g. LuSEE-Night

Extreme universe, dark phase transitions, etc:

- Cosmic neutrino and gamma ray observatories
- LIGO upgrades, future GW observatories and pathfinders

Possible path forward to search wide: Expand Dark Matter New Initiatives

Captions Here

Example of funding competition for a broad, coordinated program of small experiments

- 2019: Following Basic Research Needs white paper, DOE FOA was issued. 6 ideas for few \$10M scale projects selected for “cd0” and 2-year design study.
- Ideas spanned portal DM, axion DM, fixed target dark sectors expts.
- Still need to actually fund the experiments beyond the design studies. Reviewed in 2022, but not inserted into DOE budget yet.
- Experimental duration ~ 5 years \ll 10-year scale of Snowmass/P5.
- Good recipe to remain nimble as new technologies and ideas mature.
- **Need to broaden this program to accomplish portfolio of small experiments in order to achieve significant and coordinated logarithmic coverage of DM parameter space.**