

Abstract:

The KITP program “Dark Matter Theory, Simulation, and Analysis in the Era of Large Surveys” successfully achieved its major goals of advancing dark matter (DM) research by fostering interdisciplinary collaboration and developing critical tools for DM discovery. Timed to align with key upcoming large-scale astronomical surveys, the program brought together experts from particle theory, simulation, and cosmological data analysis to address the challenges of detecting and confirming DM signals. Through daily presentations, all-hands meetings, and over 20 splinter discussions, the program facilitated knowledge exchange across traditionally separate subfields and focused on cross-pollination between experts in astrophysics, cosmology, and particle physics.

Key accomplishments include defining potential paths to DM discovery using telescopes, exploring new particle physics DM models, and forging collaborations that aim to advance forward modeling techniques crucial for interpreting data from upcoming surveys. The program placed special emphasis on integrating diverse perspectives on joint analyses of both existing and forthcoming datasets. Notable outcomes included new collaborations and projects, particularly around probe combination, cosmological simulation, and small-scale structure modeling, which helped bridge gaps between different research communities.

The program’s impact on the field is expected to be significant, as it not only created new research collaborations but also provided researchers with exposure to new methodologies and areas of study, broadening their expertise. The conference held during the program, "Cosmic Signals of Dark Matter Physics: New Synergies," further spurred interdisciplinary discussions. Overall, the program has set a foundation for future DM discovery efforts as large surveys come online, and it has positively influenced the careers of many participants by providing networking opportunities and fostering new connections.

KITP Program Report (Sep. 2024)

Dark Matter Theory, Simulation, and Analysis in the Era of Large Surveys

Coordinators:

Vera Gluscevic, Kimberly Boddy, Ferah Munshi, Annika Peter, Ethan Nadler

Background

Observations of the Universe testify to the existence of dark matter (DM) that sources gravitational potentials and underpins structure on a variety of observable scales. But the fundamental nature of DM remains unknown, and its existence implies new physics whose investigation centrally drives research at the intersection of astrophysics, cosmology, and particle physics.

Within the next few years, large-scale surveys—including galaxy surveys, measurements of the cosmic microwave background (CMB) temperature, polarization, and lensing anisotropy, and line-intensity mapping—will begin to reach sufficient raw sensitivity to potentially uncover DM signals that are invisible to present-day searches. In combination, these facilities will enable a suite of observational tests, providing constraints on various fundamental particle properties of DM and propelling future model-building efforts within the particle physics community.

However, further progress with observational searches for the fundamental nature of DM hinges on development of theory, simulation, and analysis tools to reliably identify beyond- Λ CDM signals across physical scales and throughout cosmic history. In particular, detection and confirmation of a signal will require going far beyond the existing approaches and enabling consistent and fast signal modeling for a range of probes, and a comprehensive coverage of interesting theoretical models with a range of data sets. Development of these tools necessitates coordination between three facets of DM research: particle theory, simulation, and cosmological data analyses. The KITP program “Dark Matter Theory, Simulation, and Analysis in the Era of Large Surveys” was timed to occur just as the Snowmass and Astro2020 decadal surveys delivered their results, and just before some of the key observational facilities began delivering first light. **The program aimed to facilitate coordination between key communities and was dedicated to accelerating collaboration that would lead to development of critical tools for DM discovery at the dawn of large surveys.**

Program organization

The program featured one or two brief talks each day, delivered by participants at various career stages (including graduate students, postdocs, junior faculty, and senior faculty), with presenters chosen to represent diverse research directions and strategies. These talks were followed by open discussions, moderated by the organizers. Mondays were reserved for all-hands check-in meetings, where participants had the opportunity to present a single slide showcasing a result they had achieved during the week. Junior participants, in particular, used this platform to highlight their latest

findings. Additionally, the organizers facilitated over 20 participant-organized topical splinter discussions that covered all three major themes of the workshop. Most of these sessions focused on cross-pollination between traditionally separate subfields, each with its own jargon and methodologies. Many discussions were specifically aimed at engaging with "the other community" (e.g., *Surveys for Theorists*, see below). The organizers received overwhelmingly positive verbal and written feedback regarding the value of these sessions in fostering connections with research outside participants' primary areas of expertise. A sample of the notes resulting from splinter discussions is included in the Products section below. Organizers are considering the possibility of converting program notes into a white paper in the coming year.

Conference

We held the "Cosmic Signals of Dark Matter Physics: New Synergies" conference during the third week of the workshop. The conference featured a diverse set of speakers and topics. We maxed out the registration cap early, showing the high demand for this kind of conference. Our participants were interactive, and the wide set of topics and approaches to DM spurred significant interdisciplinary discussion. The daily end-of-day discussions could have continued for far longer than the 30 minutes we allocated for them (and in practice, the discussions continued for nearly an hour). Key discussion themes included (i) benchmark targets for DM discovery; (ii) the role of simulations in next-generation DM analyses; (iii) the interplay between linear and small-scale cosmological probes; and (iv) novel observational signatures of DM microphysics. One of the summary plots developed in the first discussion has appeared in talks at multiple later conferences that the organizers have attended since the KITP conference, and it was referenced frequently during the rest of the KITP workshop. Faculty from undergraduate-serving institutions and early-career researchers specifically cited the conference for connections to the broader community and for kick-starting new discussions and potential collaborations.

Program Goals and Outcomes

The original Program Goals were as follows:

1. Review recent results and define a path to DM discovery with telescopes.
2. Explore the space of particle physics DM models that can be revealed by new data.
3. Propel advances in forward modeling imminently necessary for DM discovery.
4. Catalyze development of cutting-edge joint analyses of existing and incoming data.
5. Facilitate cross-talk between the DM theory, analysis, and observational community and identify the most promising avenues for observational DM detection.

Analysis of participant reports, the publication list, and feedback from both participants and program products indicate that the primary goals were successfully achieved. We highlight the following:

- Program activities, including all-hands meetings and participant presentations, aimed to review the status of the field and explore the space of DM models, meeting the program's

first two goals. Special attention was given to covering innovative topics outside the mainstream in the field.

- Forward modeling of small-scale structure and the combination of different probes featured prominently throughout the program, in both all-hands activities and splinter meetings. Key topics included optimal modeling choices, cross-comparison of different simulation suites, semi-analytic modeling approaches, and cross-community discussions between experts on large-scale analysis and near-field cosmology. For example, discussions around *Probe Combination* (see below) and those in Week 8 were central to these efforts. These interactions fostered new collaborations, fulfilling the third and fourth goals of the program.
- The final program goal was targeted throughout, from the selection of participants representing three research communities that rarely come together in joint meetings to splinter sessions designed to promote knowledge transfer and collaboration rather than self-promotion. Notable examples of this were the discussions on *CMB Secondaries* and *Surveys for Theorists* (see below).

The key impact of the program on the field was the creation of new collaborations and projects (listed below), which helped bridge gaps between different communities focusing on DM research. The program had a positive effect on individual careers as well, exposing researchers to new techniques, broadening their understanding of adjacent research areas, and providing valuable opportunities for networking and connection.

Product examples

Over the course of the program, a number of informal splinter discussions resulted in discussion notes and summaries saved as *hackmd* documents for the community to access and utilize at a later time. A sample of the documents is linked below.

Dwarf velocity dispersions:

https://hackmd.io/@8T_hMuVuR8y0g5cGIFtPZA/rkDN2N-NA

Probe combination:

<https://hackmd.io/@6KmczzlMTRC7prorEiYMFA/rk59CgcBC>

Surveys for theorists:

<https://hackmd.io/@6KmczzlMTRC7prorEiYMFA/Sk2NywjIC>

CMB secondaries:

<https://hackmd.io/@6KmczzlMTRC7prorEiYMFA/BkDr31GwR>

Small-scale power spectrum:

<https://hackmd.io/@6KmczzlMTRC7prorEiYMFA/Hkx0iK2vC>

Broadening participation of underrepresented groups

The Program was highly popular in the community, attracting roughly three times the number of applicants, as compared to the number of available slots. Many highly qualified members of the community were therefore participating remotely, rather than in person, enabled by the zoom streaming of the program events.

The program co-organizers adopted several research-based best practices to broaden participation from traditionally underrepresented groups in the program and conference:

- We engaged in active recruitment, personally encouraging applications from a diverse range of experts in the field by leveraging our personal networks and promoting the program at conferences and workshops leading up to the application deadline.
- When recommending in-person participants to KITP, we used a pre-defined rubric to ensure diverse representation in terms of both field of study and career stage. We also made a point to discuss candidates with whom we were less familiar to ensure inclusivity.
- Upon inviting participants, we promptly provided them with local resources regarding partner participation, housing, and childcare, and we invited feedback on any obstacles they might face in attending.
- During the program, we facilitated all splinter events, ensuring that everyone was aware of and invited to discussions.
- Before each discussion session, we emphasized the importance of adhering to the KITP code of conduct and introduced our inclusivity and equity liaison, Ferah Munshi.
- We also established an anonymous feedback form to allow participants to raise any concerns, which was monitored throughout the program. Any issues reported were addressed promptly in collaboration with KITP staff.
- During discussions, we ensured the environment remained friendly and collegial, with open encouragement for junior scholars to participate. We also implemented an online question submission system to further remove barriers to participation.
- Finally, we organized regular lunches focused on topics relevant to minoritized groups in STEM, fostering inclusive and meaningful discussions.

The Demographic Survey had a response rate of 84% (65 out of 77 participants who were not KITP/UCSB locals). Among the respondents, 27 identified as women, 35 as men, and 3 as nonbinary. In terms of race and ethnicity, 19 participants identified as Asian, 38 as white, 5 as Hispanic or Latino (including 1 as Native and 1 as white), 3 as US Hispanic, and 3 as multiracial or another race not listed.

Projects, collaborations, and manuscripts

Currently reported manuscripts include:

- Crumrine, W., Nadler, E. O., An, R., and Gluscevic, V. (2024). Dark Matter Coupled to Radiation: Limits from the Milky Way Satellites. arXiv:2406.19458.

- Dienes, K. R., Heurtier, L., Huang, F., Tait, T. M. P., and Thomas, B. (2024). Cosmological Stasis from Dynamical Scalars: Tracking Solutions and the Possibility of a Stasis-Induced Inflation. arXiv:2406.06830.
- Gough, A. and Uhlemann, C. (2024). When to interfere with dark matter? The impact of wave dynamics on statistics. arXiv:2405.15852.
- Yang, D., Nadler, E. O., and Yu, H.-B. (2024). Testing the parametric model for self-interacting dark matter using matched halos in cosmological simulations. arXiv:2406.10753.
- de Kruijf, J., Vanzan, E., Boddy, K. K., Raccanelli, A., Bartolo, N. (2024). Searching for Blue in the Dark. arXiv:2408.04991
- Riggs, C.; Brooks, A.; Munshi, F.; Christensen, C.; Cohen, R.; Quinn, T.; Wadsley, J. (2024) Testable Predictions for Outside-In Age Gradients in Dwarf Galaxies of all Types. arXiv:2408.10379

Reported projects and collaborations:

Aggarwal

- Worked on:
 - "Angular distributions in three-body B decays"
 - "Non-standard neutrino interactions"
 - "Origin of CP Violation in the Universe"
- Collaborated with scientists from:
 - University of Montreal
 - University of Mississippi
 - University of Hawaii.

Ali-Haimoud

- Collaborated on:
 - Testing dark matter-neutrino interactions with the CMB with Kimberly Boddy and Subhajit Ghosh.
 - Discussing 21-cm observables with Julian Munoz.
 - Using astrometry for gravitational-wave background searches with Kris Pardo and Kimberly Boddy.
 - Dark matter annihilation's impact on the 21-cm signal with Tracy Slatyer.
 - Implementation of dark matter self-interactions in N-body codes with Mariangela Lisanti.
 - Universality of matter power spectrum suppression with Trey Driskell.
- Planning to submit a joint research proposal on gravitational-wave mapping with Kris Pardo and Kimberly Boddy.

Amin

- Collaborated with Siyang Ling on "Free Streaming in Warm Wave Dark Matter" (paper submitted).
- Worked with E. Nadler on using MW satellite populations to constrain light dark matter properties.
- Discussed free-streaming transfer function calculations with Sten Delos, benefiting his ongoing research.

Baryakhtar

- Collaborated on "Searching for coupled, hyperlight scalars across cosmic history" with David Cyncynates and Zachary Weiner.
- Worked with Kim Boddy, Subhjit Ghosh, Francis-Yan Cyr-Racine, and Ken Van Tilburg on a variety of projects, including referee reports and discussions for future follow-up work.

Benson

- Refactored the Galacticus model for dark matter substructure analysis.
- Collaborated with Anna Nierenberg on analyzing JWST data of strongly lensed galaxies.
- Planned future simulations with Daniel Gilman, Xiaolong Du, and Ethan Nadler to better constrain dark matter particle properties.

Bird

- Collaborated with:
 - Vera Gluscevic on interacting dark matter.
 - Kim Boddy on the UV Hubble luminosity function.
 - Sten Delos on microlensing of ultra-compact minihalos.
- Working on a paper about the Lyman-alpha forest likelihood.

Bonaca

- Collaborated with:
 - Chris Hirata on selecting stream members for dark matter tracing.
 - Eugene Vasiliev on modeling galactic dynamics in Agama.
- Worked on two publications based on Milky Way dark matter halo potential and orbital phase space resonances.

Brooks

- Formed a new collaboration with Mariangela Lisanti and Ferah Mumshi for the DREAMS project to run high-resolution dwarf galaxy simulations.
- Continued existing collaborations with Ferah Munshi, Akaxia Cruz, and Annika Peter on SIDM simulations and galaxy shapes as proxies for DM halo shapes.

Buen-Abad

- Worked on "Brave New Dark: opportunities for Dark Sectors in cosmology."
- Integrated feedback from the conference on dark matter–dark radiation interactions, enriching ongoing papers on atomic dark matter.

Delos

- Worked on a paper proposing a new method for detecting small dark structures via gravitational wakes.
- Started new collaborations on dark matter momentum distribution's impact on spatial distribution.
- Future collaboration on detecting small dark structures using astrometric microlensing.

DeRocco

- Worked on research related to free-floating planets and microlensing.
- Attempted to begin a collaboration with Matthew Kunz on plasma physics.

Garavito-Camargo

- Initiated a research project on quantifying the dark matter distribution in Milky Way-like galaxies interacting with Magellanic Cloud satellites, in collaboration with Ethan Nadler and Yao-Yuan Mao.
- Explored projects on DM halo shapes in dwarf galaxies with Alysson Brooks and Ferah Munshi.
- Discussed hyper-velocity stars with Annika Peter.

Ghosh

- Collaborated on:
 - Probing BSM physics with UV Luminosity function (with Yacine Ali-Haïmoud, Kimberly K. Boddy, Julian B. Munoz).
 - Enhancing the matter power spectrum from small-scale structures (with Rui An, Kimberly K. Boddy, Vera Gluscevic, Ethan O. Nadler, and others).
- Co-authored a paper on Dark Matter-Radiation Scattering Enhances CMB Acoustic Phase Shift with Yuhsin Tsai.

Grin

- Worked on a referee report on two-field early dark energy and collaborated with Adam Lidz and Raghu Ghara on fuzzy dark matter halos.
- Convened a discussion on strong-lens system modeling of alternative dark matter models.

- Collaborated with Tracy Slatyer on early universe sound speed modeling and with Kim Boddy, Elisabeth Krause, and Vera Gluscevic on modifying the CLASS code.

Lehmann

- Collaborated with Tracy Slatyer and Jessie Shelton on preexisting projects.
- Formed collaborations with Mustafa Amin, Sten Delos, Jo Dunkley, Ting Li, and others on various dark matter and gravitational wave propagation topics.
- Started manuscripts on testing Planck-scale dark matter with the NANOGrav signal, evaporation of ultralight dark matter, and stellar stream velocity distortions.

Lisanti

- Progressed on a joint-likelihood constraint paper using Big Bang Nucleosynthesis (BBN) and Cosmic Microwave Background (CMB) data.
- Presented the DREAMS Project on hydrodynamic cosmological simulations of non-CDM models, sparking potential new collaborations.

Long

- Worked with Mustafa Amin and Moira Venegas on modified cosmological expansion history's impact on dark matter free streaming.
- Collaborated with Kim Boddy, Adrienne Erickcek, Sten Delos, and others on topics related to inflation, isocurvature, and gravitational dark matter production.

Muñoz

- Collaborated with Kim Boddy and Subhjit Gosh on dark matter relics and with Yacine Ali Haimoud on light relics in large-scale structures.
- Co-led discussions on combining datasets across redshifts with Elisabeth Krause.
- Worked with Adrienne Erickcek on the impact of annihilating dark matter on the 21-cm signal.

Nadler

- Worked on COZMIC simulations with Rui An, Vera Gluscevic, Andrew Benson, Daneng Yang, Hai-Bo Yu, and Xiaolong Du.
- Collaborated on projects including JWST galaxy analysis, Milky Way halo shape impact, subhalo populations in galaxy groups, and reionization impact on dwarf galaxies.
- Formed new collaborations with Sophia Lilleengen, Nicolas Garavito-Camargo, and Charles Gannon.

Parikh

- Formed a new collaboration with Kim Boddy on self-interacting dark matter models.

- Continued collaboration with Tracy Slatyer on Sommerfeld enhancement in dark matter annihilation.
- Worked on a paper exploring dark matter subhalo effects on stellar streams.

Cyr-Racine

- Worked on two manuscripts:
 - Impact of Standard Model processes on the matter fluctuation spectrum.
 - Constraints on self-interacting dark matter (SIDM) from Milky Way satellites.
- Formed a new collaboration with Schutz on thermal dark matter and continued collaboration with Nadler on Milky Way satellites. A potential project was also discussed with Kaplinghat.

Schutz

- Formed collaborations with:
 - Vera Gluscevic and her postdoc.
 - Francis-Yan Cyr-Racine on thermal dark matter.
 - Ethan Nadler on writing a note about a misconception regarding warm dark matter.
- Worked on three manuscripts: "Photon self-energy at all temperatures," "Direct Detection of the Millicharged Background," and lecture notes for TASI.

Shelton

- Progressed on projects involving:
 - Detecting heating in stellar streams with Ben Lehmann.
 - Modifications to the matter power spectrum induced by axion kination with Adrienne Erickcek.
- Engaged in productive discussions with Sten Delos, Mustafa Amin, Flip Tanedo, and Kimberly Boddy, which may lead to future collaborations.

Simon

- Finalized analyses on Milky Way satellite galaxies Pictor I and Hydra II.
- Began a study of the instrumentation suite for the Magellan telescopes.
- Developed data reduction procedures for the IMACS spectrograph.
- Collaborated with Juna Kollmeier on instrumentation, Ferah Munshi on dwarf galaxy simulations, and Ethan Nadler on probing galaxy formation histories.

Slatyer

- Worked on:
 - Sommerfeld enhancement to dark matter annihilation with Aditya Parikh and Ben Lehmann.
 - A project on dark matter physics with 21cm observations.

- A collaboration with Ioana Zelko on using foregrounds pipelines for cosmic microwave background (CMB) distortions.
- Continued ongoing work with collaborators Julian Munoz, Ben Lehmann, and Aditya Parikh.

Thomas

- Collaborated with Fei Huang on a project related to cosmological stasis, published on arXiv.
- Formed a new collaboration with Haibo Yu and Daneng Yang on simulating the effect of non-thermal dark matter on satellite counts and halo profiles.
- Initiated discussions with Kimberly Boddy and Subhjit Ghosh on the dark matter velocity distribution.

Yang

- Finalized a paper on testing the parametric model using matched halos in cosmological simulations with Ethan Nadler and Haibo Yu.
- Collaborated with Rui An, Vera Gluscevic, and Andrew Benson on the warm-SIDM project.
- Initiated new collaborations on simulating non-thermal dark matter and further explored SIDM with various participants.

Yu

- Worked on three papers:
 - "Testing the parametric model for self-interacting dark matter using matched halos."
 - "COZMIC. III. Cosmological Zoom-in Simulations of Warm Self-interacting Dark Matter."
 - "Stellar streams and SIDM."
- Formed new collaborations with Brooks Thomas, Ting Li, Giulia Despali, and Moritz Fischer, as well as with existing collaborators including Ethan Nadler and Vera Gluscevic.

Zeng

- Finished a draft of a working paper on SIDM dwarf galaxies.
- Collaborated with group members on the tidal track paper and beta-calibration.
- Initiated discussions on SIDM with Frank van den Bosch, Ting Li, Mike Petersen, and Nico Garavito Camargo.

Zhong

- Focused on research into self-interacting dark matter and neutrinos.
- Collaborated with Ethan Nadler and Vera Gluscevic to apply the fluid model to interacting dark matter simulations.
- Inspired to host a similar collaborative event in Hong Kong to foster knowledge exchange.

Suggestions for future organizers

Coordination and open invitations to splinter talks were critical to ensure everyone felt welcome and was able to attend every discussion. Encouraging and affirming questions from junior members of the audience was also well received, and the use of online tools for in-talk anonymous question asking can also help. Community-building activities are a critical part of the program, especially for inter-disciplinary events. Keeping track of last-minute participation changes is important, and it is important to have a defined prioritization algorithm to let administration take care of substitutes for last-minute cancellations.

DARKMATTER24 Participants

Participant	Participation Dates
Yash Aggarwal (UC Riverside)	June 30 - July 6
Yacine Ali Haimoud (NYU)	June 3 - June 21
Mustafa Amin (Rice)	June 30 - July 13
Alexandra Amon (Cambridge)	June 9 - June 29
Rui An (USC)	May 20 - June 21
Maria Baryakhtar (Washington)	May 20 - May 31
Andrew Benson (Carnegie Observatories)	May 20 - June 14
Souradip Bhattacharyya (Ohio State)	May 20 - July 12
Simeon Bird (UC Riverside)	July 1 - July 12
Kimberly Boddy (Texas)	May 20 - July 12
Ana Bonaca (Carnegie Observatories)	May 20 - June 23
Sownak Bose (ICC Durham)	May 26 - June 15
Alyson Brooks (Rutgers)	June 24 - July 12
I Kai Chen (NYU)	May 20 - June 7
Cyril Creque Sarbinowski (Flatiron Institute)	May 27 - June 21
Akaxia Cruz (Flatiron Institute)	June 2 - June 15
David Cyncynates (Washington)	May 20 - May 31
Francis Yan Cyr Racine (UNM)	May 20 - June 7
William De Rocco (UCSC)	June 30 - July 6
Michael Delos (Carnegie Observatories)	June 16 - July 13
Giulia Despali (Univ. of Bologna)	May 20 - June 7
Christopher Dessert (Flatiron Institute)	May 20 - May 31
George Driskell (USC)	May 28 - June 29
Alex Drlica Wagner (Fermilab)	June 2 - June 28
Xiaolong Du (UCLA)	June 10 - July 12
Jo Dunkley (Princeton)	June 17 - July 12
Anna Engelhardt (George Mason)	June 2 - June 29
Adrienne Erickcek (UNC)	June 17 - July 12
Charles Gannon (UC Merced)	June 10 - July 5
Yang Gao (SUSTech)	June 24 - July 5
Nicolas Garavito Camargo (Flatiron Institute)	June 24 - July 13
Subhajit Ghosh (Notre Dame)	May 20 - June 14
Cara Giovanetti (NYU)	May 20 - June 7
Vera Gluscevic (USC)	May 20 - July 12
Nicole Gountanis (Ohio State)	May 19 - July 13
Daniel Grin (Haverford College)	June 2 - June 22
Adam He (University of Southern California)	May 27 - July 12
Christopher Hirata (Ohio State)	May 20 - July 12
Mikhail Ivanov (CTP)	May 20 - June 8
Ryan Keeley (UC Merced)	June 16 - July 6
Stacy Kim (Carnegie Observatories)	May 20 - June 7

DARKMATTER24 Participants

Participant	Participation Dates
Juna Kollmeier (Carnegie Observatories)	May 20 - June 29
Elisabeth Krause (Arizona)	June 2 - June 15
Benjamin Lehmann (MIT)	June 17 - July 5
Ting Li (Univ. of Toronto)	June 2 - June 22
Sophia Lilleengen (Durham Univ.)	May 20 - June 7
Mariangela Lisanti (Princeton)	June 3 - June 21
Andrew Long (Rice)	June 16 - June 29
Charlie Mace (Ohio State)	May 20 - June 28
Yao Yuan Mao (Utah)	June 24 - July 12
Julian Munoz (Texas)	June 10 - June 21
Ferah Munshi (George Mason)	May 20 - July 12
Nathan Musoke (UNH)	June 10 - June 21
Ethan Nadler (Carnegie Observatories)	May 20 - July 12
Anna Nierenberg (UC Merced)	June 9 - July 11
Kris Pardo (USC)	June 2 - June 15
Aditya Parikh (Stony Brook)	May 20 - June 7
Annika Peter (Ohio State)	May 20 - July 12
Joshua Ruderman (NYU)	June 16 - June 29
Isabel Sands (Caltech)	June 3 - June 14
Isabel Santos Santos (ICC Durham)	June 2 - June 22
Katelin Schutz (McGill Univ.)	May 20 - June 11
Julia Shelton (Univ. of Illinois)	June 24 - July 12
Nora Shipp (MIT)	June 17 - July 5
Joshua Simon (Carnegie Institution)	May 20 - June 1
Tracy Slatyer (MIT)	June 3 - June 21
Eleanor Stuart (USC)	June 2 - June 15
Philip Tanedo (UC Riverside)	June 24 - July 12
Yuhsin Tsai (Notre Dame)	May 20 - May 25
Yu Dai Tsai (UCI)	June 30 - July 13
Ken Van Tilburg (Flatiron Institute)	May 20 - June 21
Risa Wechsler (Stanford)	May 20 - June 14
Weishuang Xu (LBNL)	May 26 - June 1
Daneng Yang (UC Riverside)	May 20 - June 14
Hai Bo Yu (UC Riverside)	June 3 - June 14
Zhichao Zeng (Ohio State)	May 20 - July 12
Yiming Zhong (CityU)	June 23 - July 6

DARKMATTER24 Program Talks

Speaker	Title	Date
Francis-Yan Cyr-Racine (U of New Mexico)	Imprints of Standard Model processes on the matter fluctuation spectrum	May 21
Yuhsin Tsai (U of Notre Dame)	Dark Matter-Radiation Scattering Enhances CMB Acoustic Phase Shift.	May 22
Rui An (USC)	Interacting light thermal-relic dark matter: self-consistent cosmological bounds	May 23
Vera Gluscevic (USC)	"Hack" session	May 23
Carlo Giocoli (Bologna Obs.)	Mass Distribution in Galaxy Clusters: from Simulations to Stage-4 Surveys	May 24
Sophia Lilleengen (Durham)	Stellar streams and basis function expansions as dark matter probing tools	May 29
Ana Bonaca (Carnegie)	Constraining the nature of dark matter with stellar streams	May 30
Subhjit Ghosh (UT Austin)	Cosmological case study of a tower of neutrino states	May 31
darkmatter24 workshop (N/A)	darkmatter24: weekly kick-off meeting	June 10
Elisabeth Krause (Arizona)	Weak lensing with $O(1)$ galaxies	June 11
Isabel Santos Santos (ICC Durham)	The Radial Distribution of Galactic Satellites: A Probe for Dark Matter	June 12
Daneng Yang (UC Riverside)	How well do we have gravothermal phases in self-interacting dark matter halos?	June 13
Carton Zeng (Ohio State)	SIDM subhalos and satellite galaxies: evolution and diversity	June 13
Tracy Slatyer (MIT)	21cm as a probe for decaying dark matter	June 14
Elisabeth Krause (Arizona)	Modeling Hack	June 14
Mariangela Lisanti (Princeton)	The DREAMS Project: Accounting for Uncertainties in Baryon and Dark Matter Physics in Hydrodynamical Simulations	June 18
Nathan Musoke (UNH)	Do predictions for axion like dark matter change in light of the axiverse?	June 20
Juna Kollmeier (CITA)	Map them All: The Next Generation of Spectroscopic Sky Mapping	June 21
Nicolas Garavito-Camargo (Flatiron Institute)	Dark Matter Wakes in CDM	June 25
Adrienne Erickcek (UNC Chapel Hill)	Extracting the expansion history from the matter power spectrum	June 26
Robyn Sanderson (Penn)	Creating synthetic resolved-star surveys with ananke	June 27
Nora Shipp (CMU/UW)	Disrupting Satellites Across Simulations	June 28
All participants (darkmatter24)	Weekly meet and greet	July 1
Ryan Keeley (UC Merced)	Strongest gravitational lensing limit on the dark matter free streaming length to date	July 2
Yao-Yuan Mao (Utah)	Finding Nearby Low-mass Galaxies: The SAGA Survey and Beyond	July 3
Flip Tanedo (UC Riverside)	Direct Collapse Black Holes from Dark Matter Annihilation	July 5
All participants (darkmatter24)	Welcome to the last week of the program	July 8
Simeon Bird (UC Riverside)	PRIYA simulations hack	July 9
Adam He (USC)	S8 Tension in the Context of Beyond-CDM Models	July 10
Xiaolong Du (UCLA)	Tidal evolution of cored and cuspy dark matter halos	July 11
Mustafa Amin (Rice)	Spin Angular Momentum in Wave Dark Matter	July 11
Vera Gluscevic (USC)	Conclusion of the program	July 12