1. Coordinator Commitments

All four of us intend to stay at KITP for the full duration of the program.

2. Name of Diversity Coordinator

Sasha Tchekhovskoy will be the diversity coordinator.

3. Diverse list of Key Long Term Participants.

The following is a list of our 13 key long-term participants who have committed to staying for 6 weeks or longer: Pallavi Bhat*, Omer Blaes, Megan Donahue*, Alex Lazarian, Evangelia Ntormousi*, Peng Oh, Eve Ostriker*, Eliot Quataert, Lorenzo Sironi, James Stone, Ethan Vishniac, Irina Zhuravleva*, Ellen Zweibel*. 6 of them (marked with *) come from under-respresented groups in astronomy. In addition, Tamara Bogdanovic*, Yan-fei Jiang, and Mark Voit can only commit to 3 weeks at the moment but will try to stay for 6 if possible.

4. Conference timing and Lead Point of Contact

The proposed time (February 20-23, 2024) works for all of us.

Axel Brandenburg will be the lead point of contact for the conference.

5. Blurb(S) for Program and Conference

For the program:

Turbulence is ubiquitous in the universe across a vast range of length scales and crucially affects diverse astrophysical processes, such as star and planet formation, cosmic ray acceleration and transport, cold gas formation in circumgalactic environments, dynamo amplification of magnetic fields, accretion, and magnetic reconnection in high-energy astrophysical environments. Despite their scientific significance, direct measurements of turbulence in most astrophysical environments are challenging due to the limited sample sizes, resolution, projection effects, and coupling between different physical quantities.

On the theoretical and computational side, advances in plasma and fluid dynamics simulations in recent years have enabled us to characterize magnetized turbulence in great detail and achieve a new understanding of turbulence over a wide range of scales, both in idealized settings and realistic astrophysical contexts, ranging from the interior of stars, Solar wind,

accretion disks, relativistic jets and outflows, to gas in and around galaxies and galaxy clusters. On the observational side, thanks to advanced observational facilities and techniques, it is now possible to probe the roles turbulence plays in a wide range of astrophysical environments with unprecedented sample size and precision.

The proposed KITP program will take advantage of these advances and bring together experts in theory, computation, and observation from various sub-fields of astrophysics and plasma physics. Participants will greatly benefit from interdisciplinary discussions and collaborations. Some of the topics to be discussed include: How to extract the maximum insight into turbulence from the numerical simulations of different astrophysical environments?
How can we test theory and numerical simulations using observations of astrophysical turbulence? What are the challenges facing different sub-fields, and what opportunities for cross-fertilization exist? How to capitalize upon our growing understanding of turbulence to build better models of astrophysical systems? How to incorporate turbulence into global models when global direct numerical simulations are prohibitive due to the vast scale separations? What new insights into astrophysical turbulence can be obtained from ongoing and future missions and experiments?

For the conference:

Turbulence is an important process in various astrophysical environments and over vast scales. These environments range from the interior of stars, the solar wind, accretion flows, disks, jets, the interstellar medium, the circum-galactic medium, to the intra-cluster medium. The past couple of decades have seen great advances in both observational and theoretical studies of astrophysical turbulence. The advances in understanding and measuring turbulence also bring significant changes in many branches of astronomy.

This conference will bring together turbulence experts from a wide range of sub-fields in astrophysics as well as theorists of complex systems and nonlinear science. The goal is to encourage and enhance interdisciplinary discussions and collaborations. The conference will cover many diverse topics, including: turbulent dynamo, magnetic reconnection, plasma physics, space physics, unresolved physics and sub-grid models in numerical simulations, turbulence in the laboratory, new observational techniques for diagnosing turbulence, connecting observations and models, astrophysical applications of turbulence physics (star formation, cosmic rays, accretion, galaxy formation and evolution, etc), and connecting turbulence and other astrophysical frontiers (e.g., time-domain astronomy, big-data astronomy, and multi-messenger astronomy).

6. LOGO(S) for Program and Conference

Logo for workshop:

Logo for conference: