Zoya Vallari

Postdoctoral Scholar **[2019 - Present]**
PMA Division
Caltech
California

EMAIL : zoya@caltech.edu
344 Lauritsen, MC 356-48
PHONE : +1 (626) 395-6267

Education

Stony Brook University Stony Brook, NY
Ph.D Particle Physics [2012 - 2018]

Indian Institute of Technology Bombay Mumbai, India
Master of Science (M.Sc), Physics [2010 - 2012]

St. Stephen's College, Delhi University New Delhi, India
Bachelor of Science (B.Sc), Physics Hons [2007 - 2010]

Research Summary

Neutrinos are one of the fundamental particles from which the universe is built. They are highly elusive as they only interact via weak force. Neutrinos come in three flavors and oscillate from one kind to another depending on their energy and the distance traveled. The flagship US experiments that I work on (NOvA and DUNE) study this property of neutrino oscillation. The first successful measurement of neutrino oscillation was awarded the Nobel Prize in 2015. Precise measurement of the oscillation parameters give us insight about the fundamental physics theories which govern how particles interact with each other. Just after Big Bang, for every billion matter-antimatter pairs, there was one extra matter particle. Equal number of matter-antimatter would annihilate each other to form energy leaving nothing else in the Universe. The reason for this tiny excess of matter particles that create the universe is yet-unknown. Measuring neutrino oscillation precisely could provide us with hints to solve the matter-antimatter asymmetry.

Selected Publications

- *Constraint on the Matter-Antimatter Symmetry-Violating Phase in Neutrino Oscillations*
  K. Abe et al (T2K Collaboration); arXiv:1910.03887; Nature 580, 305 (2020)
  Media Highlight:
  NY Times : Why the Big Bang produced something rather than nothing
  BBC : Biggest cosmic mystery 'step closer' to solution
  Independent UK : Major new breakthrough could help reveal origin of the Universe, Scientists say
  El Mundo: Un experimento con neutrinos y antineutrinos para explicar la composicil universo actual

- *Search for CP Violation in Neutrino and Antineutrino Oscillations by the T2K Experiment with 2.2×10^{21} Protons on Target*
  K. Abe et al (T2K Collaboration); arXiv:1807.07891; Phys. Rev. Lett. 121, 171802 (2018)

- *Combined analysis of neutrino and antineutrino oscillations at T2K*
  K. Abe et al (T2K Collaboration); arXiv:1701.00432; Phys. Rev. Lett. 118, 151801 (2017)

- *Measurement of neutrino and antineutrino oscillations by the T2K experiment including a new additional sample of ν_e interactions at the far detector*
  K. Abe et al (T2K Collaboration); arXiv:1707.01048; Phys. Rev. D 96, 092006 (2017)

Selected Conferences & Seminars

Rising Star in Experimental Particle Physics Symposium — Chicago, US
Invited talk — [October, 2021]

Institute for Nuclear and Particle Astrophysics Seminar — Berkeley, US
Lawrence Berkeley National Lab — [April, 2021]
Invited seminar

XIX International Workshop on Neutrino Telescopes — Padova, Italy
Parallel talk — [February, 2021]

Michigan State University Particle Physics Seminar — Lansing, US
Invited seminar — [February, 2021]

NuHorizons International Conference — Allahabad, India
Invited plenary talk — [2018]

International Workshop on Neutrino-Nucleus Interactions (NuINT) — Toronto, Canada
Poster presentation — [2017]

Professional Service

- Convener of NOvA Production team that is tasked to generate and produce all simulated and data files for the experiment.
- Reviewer for Physical Review D Journal which publishes articles in the field of particles, fields, gravitation, and cosmology physics.
- Session chair and judged talks for New Perspectives 2020 conference.
- Judge for poster presentations at Users meeting '20 and session chair at Users meeting '21 at Fermi National Accelerator Laboratory.
- First elected representative of T2K-Young to represent graduate students and postdocs and their interests at the collaboration.

- Founding member of T2K-Women, a group to enable networking of women within T2K and provide a forum to discuss gender and equity issues.
- President of Graduate Women in Science and Engineering group at Stony Brook University, leading a team of 10 council members to organize talks, workshops and other events to promote women and other minorities in STEM fields.
- Student representative of Diversity Committee at Department of Physics and Astronomy, Stony Brook University. Established a faculty-student mentorship program to help curb the fallout rate of under-represented minorities.

Public Involvement & Outreach

- Mentored an undergraduate student on a research project as part of the Freshman Summer Research Institute - a program designed to provide academic support to the incoming class of underrepresented students at Caltech. [Aug-Sep, 2021]
- Co-developed and taught a month long course on *Science and Society* for an after school program for high-school students of underserved communities in Pasadena, California. [April-May, 2021]
- Featured in an article on neutrino mass hierarchy in *Symmetry Magazine*. [May, 2021]
- Featured on the *Story Collider* podcast. [March, 2019]
- Designed and taught a course on *Introduction to Particle Physics* for an honors program for undergraduate women at Stony Brook University. [Spring, 2016]

Awards & Fellowship

- Won the Rising Star in Experimental Particle Physics award and was invited to present my work in the symposium. [2021]
- Awarded the American Association of University Women (AAUW) International Fellowship for academic achievement and commitment towards women and girls. [2017-2018]
- Won the first prize and people's choice award at the university wide 3 Minute Thesis competition for presenting my thesis research to a non-expert audience. [2017]
- Awarded the Institute Silver Medal for receiving highest grades in the masters program at Indian Institute of Technology, Bombay. [2012]
- Qualified the National Eligibility Test with a Junior Research Fellowship Award conducted by the University Grants Commission, India. [2012]
- Inaugural recipient of 'Innovation in Science Pursuit for Inspired Research' (INSPIRE) Scholarship by Department of Science and Technology, Govt. of India. [2007-2012]

Skills

Software: Docker, Singularity, Git, CVS, SVN
Coding: C++, ROOT, Python
Hardware: Machine Shop Tools: Lathe, Milling, Drill Press
Languages: Hindi (native), English (fluent)
Science Communication: Trained at Alan Alda Center for Communicating Sciences
Others: Dance, Capoeira, Theatre