UC RIVERSIDE | UNIVERSITY OF CALIFORNIA
Department of Physics & Astronomy

Department of Physics and Astronomy
University of California
900 University Ave, Riverside CA 92521

May 5, 2019

To the DUNE:
Institutional Board Chair
Robert Wilson, Professor of Physics at Colorado State University.
Collaboration Co-spokespersons
Edward Blucher, Professor of Physics at University of Chicago.
Stefan Soldner-Rembold, Professor of Physics at University of Manchester

To Whom It May Concern,

This is a petition letter to present an application for the University of California-Riverside to participate in the DUNE collaboration. In this letter we state our intent to join the ongoing effort within the DUNE collaboration framework in a common and coordinated manner. We hope to provide relevant contributions to the DUNE project, which we perceive as an outstanding experiment and an important step towards a worldwide neutrino research program, and aim to bring our skill set in theoretical particle physics. In particular, the PI, Yanou Cui, has already contributed to the DUNE TDR based on her past and ongoing work on boosted dark matter. In the following text we provide some details on our expectations concerning our possible participation in the DUNE collaboration and a short description of our previous activities in the theoretical particle physics field as we hope for fruitful and productive scientific relations in the near future.

Sincerely,

Yanou Cui

Assistant Professor
Department of Physics and Astronomy
University of California, Riverside

Previous research background

The PI has been an active researcher for many years in theoretical studies for beyond the Standard Model particle physics. In recent years, the PI has made important, original contributions to diverse research topics at the interface of particle physics and cosmology, such as on dark matter and baryogenesis. In particular, related to DUNE, the PI is among the original proposers for the idea of boosted dark matter (BDM), which has become a well-recognized benchmark for dark matter searches at neutrino experiments. Super Kamionkande collaboration has published their first dedicated study on BDM, and BDM is now well known by the DUNE collaboration. The PI co-initiated a working group on BDM involving experimentalists led by Dr. Yun-Tse Tsai at SLAC, and the PI is the most senior theorist in this group playing an important role of leading/coordinating. Along with collaborators, the PI has contributed to the DUNE TDR.

Members

- 1 faculty member: Yanou Cui (with possible expansion if the department makes new hire of experimentalist in neutrino physics)
- 1 postdoc, 2 graduate students

Scientific and technical interests

We propose to contribute to DUNE in activities involving theoretical modeling and analysis with a focus on opportunities for dark matter searches. The near-term focus will be on boosted dark matter, which is a relatively new subject with a lot of room for further development. The studies will include sampling and analyzing benchmark models, as well as projecting DUNE's sensitivities to model parameter space using the simulation tools newly developed by the PI and collaborators. The comparison with the sensitivity using other relevant experiments (e.g. SuperK, conventional dark matter detectors) will also be made. We will also provide theoretical advice for DUNE's design and development based on our expertise in dark matter related studies.

Resources

The PI's current research group includes 1 postdoc and 2 graduate students who will be involved in dark matter related theoretical studies for DUNE. The PI is currently funded by a DOE high energy theory grant (proposal includes a project on BDM studies for DUNE) and is actively seeking for additional funding resources that may support DUNE-related research.