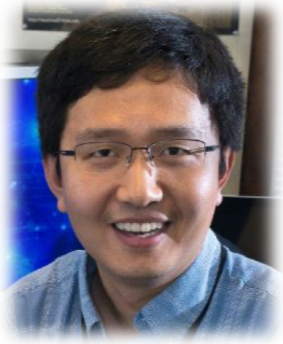


PIONEER: a next-generation pion decay experiment



Speaker: Prof. Xin Qian (钱鑫, BNL)
Time: 14:00, Monday 10 July 2023
Location: 228 Multidisciplinary Building
Indico: indico.ihep.ac.cn/event/20052
Zoom ID: 9930 9811 691
Password: 123456

Abstract:

In this seminar, I am going to introduce the physics motivation and the conceptual design of the PIONEER experiment, a next-generation rare pion decay experiment testing lepton flavor universality and CKM unitarity, are described. Phase I of the PIONEER experiment, which was proposed and approved at Paul Scherrer Institute, aims at measuring the charged-pion branching ratio to electrons vs. muons, $R_{e/\mu}$, 15 times more precisely than the current experimental result, reaching the precision of the Standard Model (SM) prediction at 1 part in 10,000. Considering several inconsistencies between the SM predictions and data pointing towards the potential violation of lepton flavor universality, the PIONEER experiment will probe non-SM explanations of these anomalies through sensitivity to quantum effects of new particles up to the PeV mass scale. The later phases of the PIONEER experiment aim at improving the experimental precision of the branching ratio of pion beta decay (BRPB), $\pi^+ \rightarrow \pi^0 e^+ \nu(\gamma)$, currently at $1.036(6) \times 10^{-8}$, by a factor of three (Phase II) and an order of magnitude (Phase III). Such precise measurements of BRPB will allow for tests of CKM unitarity considering the Cabibbo Angle Anomaly and the theoretically cleanest extraction of $|V_{ud}|$ at the 0.02% level, comparable to the deduction from superallowed beta decays.

About the speaker:

Xin Qian is a particle physics scientist working to answer some of the remaining questions in the standard model of particle physics and to search for new physics beyond the standard model. Xin obtained his Ph.D. in experimental nuclear physics from Duke University. He then joined Caltech as Robert Millikan Post-doctoral Scholar studying neutrinos. After the post-doc training, Xin joined Brookhaven National Laboratory as staff scientist and was promoted through the rank. He is currently physicist with Distinction of Tenure and adjunct associate professor at Stony Brook University. Xin has been working on numerous particle physics experiments as well as detector technologies from both hardware and software sides. Xin has won many awards including 2011 Jefferson Laboratory Thesis award, 2014 DOE early career award, 2017 EPS Young Experimental Scientist Prize for his contribution to the Daya Bay experiment, 2022 BNL Science and Technology Award (the highest honor at BNL) for his contribution to the MicroBooNE experiment and the development of LArTPC detector technology. Today, he is going to tell us about his new initiative on the next-generation rare pion decay experiment.