Open Position: Postdoc at the Massachusetts Institute of Technology

The Conrad Group in the Physics Department at MIT looking for a postdoc for the RFQ-Direct Injection Project (RFQ-DIP). This project aims to design, construct and study axial injection into cyclotrons using an RFQ as buncher. To this end a new RFQ and 1 MeV test cyclotron will be constructed. After RFQ-DIP, the RFQ will become the front-end of the IsoDAR Experiment.

Introduction

The purpose of IsoDAR is to test observed anomalies in neutrino experiments that point to a nearly-non-interacting cousin to the neutrinos of the Standard Model. Discovery of "sterile neutrinos", as these yet-unproven partners are called, would be revolutionary.

In the IsoDAR design, 60 MeV protons impinge on a beryllium target to produce neutrons which enter a FLiBe sleeve and capture on ^{7}Li. This produces ^{8}Li, which subsequently beta-decays to produce $\bar{\nu}_e$ (electron-antineutrinos). Interactions of these neutrinos can be observed in a large liquid scintillator detector, such as KamLAND. Disappearance of the $\bar{\nu}_e$ through oscillations would signal the existence of sterile neutrinos.

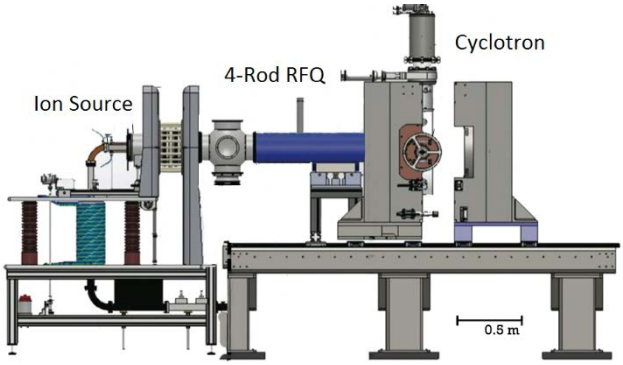

Figure 1: Schematic of the RFQ Test Bench with 1 MeV cyclotron

Achieving the necessary neutrino flux for IsoDAR requires 10 mA of protons on target. This is about a factor of five higher than has been demonstrated in modern cyclotrons. We have approached this goal in two steps. The first innovation was the use of an H_2^+ beam. This reduces space-charge forces, overcoming the limitations of injecting an intense beam into the central region of a compact cyclotron. The second innovation – the subject of this research – is to make use of RFQ injection of H_2^+ into a compact cyclotron (see figure). This technique has not been demonstrated before, and will be transformative to the field.

This project has been fully funded by the US National Science Foundation (NSF). The position is now open.

Qualifications

Necessary: PhD in physics or engineering, knowledge of FEA software. Prior experience either in the field of ion sources or particle accelerators. Team work oriented and willing to take on a leadership role in this project.

Recommended: Good programming skills in python, knowledge of RF technology and RFQ's, vacuum technology, high voltage engineering, and cyclotrons. CAD software.

Contact

If you are interested, please contact Prof. Janet Conrad with your CV.

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