July 2, 2023

Cover Letter

Dear Sir/Ma'am,

I am applying for the assistant professor position with the intention of continuing my work in experimental high-energy physics at your esteemed institution. Currently, I hold the position of postdoctoral fellow at the TRI University Meson Facility (TRIUMF) in Vancouver, British Columbia, Canada. In my current role, I am actively involved in various significant projects, including the design of the Water Cherenkov Test Experiment (WCTE) and the Intermediate Water Cherenkov Detector (IWCD) for the Hyper-Kamiokande (Hyper-K) experiment. I contribute to developing and constructing multi-PMT photosensors, implementing the mPMT model in GEANT4 simulation, and planning to conduct physics analysis utilizing WCTE data.

My responsibilities as the lead in mPMT photosensor research and development at TRIUMF involve creating numerous prototypes to finalize the design of the mPMT and establishing a process for manufacturing and testing these photosensors. I have actively contributed to various aspects of the mPMT photosensor research and development, including efficiency measurements, data analysis framework development, setup implementation, DAQ development, etc. Also, the development of quality control procedures to ensure component tolerance and detector testing. Additionally, I am developing the mPMT model in GEANT4, allowing us to simulate the behaviour of the mPMTs in a virtual environment and study their response to different light sources and conditions. In parallel, preparing results for publications and contributing to the Technical Design Report (TDR) for the WCTE, specifically focusing on the mPMT photosensors research and development, prototyping, and assemblies. Furthermore, I supervise PhD, Master's, and Co-Op/undergraduate students involved in the project and regularly host meetings within the collaboration to receive updates from various sites worldwide.

During my PhD, my primary focus was on physics analysis and the upgrade of the muon system for the Compact Muon Solenoid (CMS) experiment at the Large Hadron Collider (LHC). In terms of physics analysis, my work centred around the associated production of dark matter with the Higgs boson decaying to a pair of bottom quarks. On the hardware side, I was extensively involved in producing and testing Gas Electron Multiplier (GEM) detectors and their front-end and back-end electronics for the CMS upgrade. I also played a leading role in the research and development of India-made GEM foils and detectors.

My experience in micro-pattern gaseous detectors (GEM) assembly and testing, particularly for CMS Muon chamber upgrades, is extensive. I extensively researched and developed India-made GEM foils and detectors to ensure their compatibility with future CMS experiment upgrades. I conducted tests to assess their basic and advanced characteristics and explored the potential of using GEM detectors for medical applications such as 2-D imaging. Additionally, I developed a technique utilizing the Analog Pipeline Voltage 25 (APV25) chip scalable readout system (SRS) for determining the uniformity of the induction gap in a triple-GEM detector. This technique also aids in identifying the bending of the readout board and identifying dead or damaged strips on the readout board. The applicability of this technique extends to any gaseous detector utilizing plane readout boards. Along the same line, I played a leading role in the design, testing, and commissioning of the GEMROC 64-channel ASIC for reading the current pulses from the low-gain detectors.

In addition to my research accomplishments, I have also gained valuable teaching experience throughout my academic journey. I served as an assistant professor (guest faculty) at the Department of Physics and Astrophysics, University of Delhi, where I taught a range of courses to M.Sc. (Physics) students. I have successfully taught subjects such as nuclear physics, advanced electronics, and advanced numerical techniques. In light of my extensive teaching experience, I am well-equipped to teach a wide range of physics courses at your esteemed institution.

I am capable of establishing a detector facility at your esteemed institute, I possess relevant expertise in the field. I am independent with strong writing, communication, and data interpretation skills. I have the ability to conduct focused research, produce results, and prepare proposals for funding grants. Furthermore, I am skilled in conducting independent scientific research studies, preparing results for publication, and presenting them at conferences and meetings.

Regards,

Mohit Gola