Meera Patel

Cover Letter For Prof. Dr. Björn Penning Cryogenic Dark Matter Search Position at University of Zurich

Dear Dr. Penning,

I am writing to apply for the PhD position in cryogenic dark matter searches within your group at the University of Zurich. I am completing my Master's in Physics and Astronomy at the University of Amsterdam, with my thesis at Nikhef on detector R&D for liquid noble gas experiments under Dr. Tina Pollmann. I have spent the past year doing hands-on lab work on the VULCAN experiment, including hands on hardware design, vacuum system work, and analysis development, and this sort of instrumentation driven research is the kind of work I want to continue into a PhD and beyond in my academic career.

What draws me to this position specifically is the physics case for exploring the light dark matter mass range. As WIMP-scale cross sections become increasingly constrained and pushing into the neutrino fog, I think the most compelling frontier is at lower masses, where conventional detector threshholds become limiting and and different detection strategies are needed. Given your group works on exactly this, across TESSERACT, QROCODILE, and LZ, this position is a perfect fit for my research interests. I do not have direct experience with superconducting sensors or dilution refrigerators, but developing expertise in these technologies is what I want from a PhD, and my background in hardware, cooling, and signal analysis gives me a concrete foundation to build on. The group's simultaneous involvement in LZ and XLZD also connects well with my existing work within the liquid xenon dark matter program through Nikhef.

My thesis work on VULCAN has given me experience across hardware design, data analysis, and the practical challenges of running a small-scale experiment. Combined with earlier computational work on the Fermilab g-2 experiment, I have a foundation spanning both instrumentation and analysis. I also received the Olga Igonkina Foundation Travel Grant to conduct measurements in a cryogenic liquid argon setup in Poland, and I am currently supervising a bachelor's student on the VULCAN project. I enjoy the collaborative side of research also; I regularly help officemates with CAD, programming, and the occasional integral check. I have learned work best when given independence within a collaborative group and I look forward to continuing that balance in a PhD.

Thank you for considering my application. I look forward to the possibility of contributing to your group's research.

Sincerely,
Meera Patel