Meera Patel

February 22, 2026
Dr. Alfons Weber
PRISMA++, JGU Mainz

Dear Dr. Weber,

I am writing to apply for the PhD position on the DUNE experiment within your working group at JGU Mainz and PRISMA++. My first preference is the DUNE position, but as a secondary interest, I would also be excited to contribute to the DarkMESA experiment given my broader interest in dark matter physics. I am currently completing my Master's in Physics and Astronomy at the University of Amsterdam, working on my thesis at Nikhef on detector R&D for liquid noble gas TPCs under Dr. Tina Pollmann.

My thesis work on the VULCAN experiment at Nikhef, which is connected to the liquid noble gas TPC dark matter experiments like XENONnT, involves measuring photoluminescence properties of wavelength-shifting materials at VUV wavelengths for detector R&D. I work on both the hardware and analysis sides, designing hardware upgrades for the vacuum setup, including a new SiPM cooling system to reduce dark count rates, and refactoring the data analysis pipeline with techniques such as matched filtering to recover sensitivity lost to noise. Mainly, I am installing an optical chopper designed to pulse the light to then time-resolve the decay of the photoluminescence. I also received the Olga Igonkina Foundation Travel Grant to visit AstroCENT in Poland, where I will conduct VUV photoluminescence measurements in a liquid argon cooled setup, giving me direct hands-on experience with LAr systems relevant to DUNE. Earlier, during my Bachelor's at Boston University, I worked on the Fermilab g-2 experiment, developing particle extrapolation algorithms in C++ using CERN's GEANE package and ROOT. I am comfortable working in C/C++, Python, Fortran, and Bash. I have also gained experience in supervising bachelor's students at Nikhef and enjoy teaching.

The physics goals of DUNE are what draw me most to this position. The prospect of probing CP violation in the lepton sector through precision neutrino oscillation measurements is one of the most exciting programs in particle physics today, and I have been introduced to the theoretical foundations through my astroparticle physics coursework at UvA. The DUNE-PRISM concept for controlling systematic uncertainties through off-axis measurements is an elegant approach, and I am drawn to the challenge of developing detector optimization and analysis methods to fully exploit it. My experience in detector R&D, hardware design, and data analysis has prepared me to contribute to this effort.

Thank you for considering my application. I would welcome the opportunity to discuss how my background could contribute to your group's work on DUNE.

Sincerely,
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