

# Characterisation of Cherenkov detectors for the MOLLER experiment

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The MOLLER (Measurement Of Lepton Lepton Electroweak Reaction) experiment at the Thomas Jefferson National Accelerator Facility (JLab), Newport News, Virginia, USA is aiming to measure the parity-violating asymmetry ( $A_{pv}$ ) in the electron-electron (Møller) scattering with unprecedented precision. The flux of Møller scattered electrons from the liquid hydrogen target is measured by Cherenkov detectors and the longitudinal polarisation of the incoming electron beam is rapidly flipped to extract the right-left fractional flux difference and thence  $A_{pv}$ . The discovery reach of MOLLER is unmatched by any proposed experiment measuring a flavor and CP-conserving process over the next decade.

A state of the art detector sub-system is designed to precisely measure the Møller scattered electrons with Cherenkov detectors. The foreseen highest particle rates over the entire detector region are  $\sim 150$  GHz. The radial and azimuthal segmentation of the Cherenkov detectors are chosen such that the highest rates on the individual detector are  $\sim 5$ -6 GHz. Fused silica (quartz) tiles are chosen as the Cherenkov radiator in the main integrating detectors because of their radiation hardness and negligible scintillation. A collaborative R&D effort has been carried out to investigate the performance of the prototype detectors with mono-energetic particle beam and also with cosmic muons. The Cherenkov detectors are tested at the MAMI accelerator facility in Mainz, Germany with the electron beam of energy  $\sim 855$  MeV. Other detectors such as Gas Electron Multipliers (GEM) and scintillators are being used as tracking detectors to calibrate the primary Cherenkov detectors. All the crucial detector components (e.g. electronics, 3D printed detector parts, quartz tiles etc) are tested for the radiation hardness at the Idaho Accelerator Center, Idaho, USA.

A detailed overview of the experimental goals, design, radiation hardness studies and performance of the prototype detectors in electron beam and also with cosmic muons will be presented.

## Collaboration

MOLLER

## Role of Submitter

I am the presenter

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