Contribution ID: **361** Type: **Poster**

The MOLLER experiment: A measurement of the Weak charge of the electron, using current mode electron detectors in a high radiation environment.

The MOLLER collaboration is currently preparing an experiment to measure the Weak charge of the electron to a fractional accuracy of 2.3% at very low momentum transfer, using parity violating electron scattering. At this precision, the experiment will be sensitive to the interference of the electromagnetic amplitude with new neutral current amplitudes as weak as $10^{-3} \cdot G_F$. The experiment will take place at Jefferson National Laboratory, in Newport News Virginia, USA. The experiment will measure the asymmetry in the number of 11 GeV polarized electrons scattered from electrons in a liquid hydrogen target, as a function of electron helicity. The asymmetry has a Standard Model predicted size of 35 ppb (part per billion). Together with the goal precision this requires a high luminosity beam which, at low momentum transfer and very forward scattering angles, leads to detector event rates at the level of GHz/cm^2. This requires either very high detector segmentation or current mode operation. The experiment will need to employ several detector technologies, including tracking detectors and current mode detectors. The challenges we face regarding detector design include radiation hardness (up to 15 MRad in certain regions), low noise and high efficiency operation (light yield), and background sensitivity. We are currently exploring highly segmented quartz Cherenkov detectors for current mode operation and GEM technology for tracking detectors. I will provide an overview of the current detector design, including specific challenges we are facing, as well as some results from initial prototype tests.

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Track Classification: Experiments: 2a) Experiments & Upgrades