The University of New Hampshire Nuclear Particle Physics Group and specifically the Polarized Target Lab is located in DeMeritt Hall. At the Polarized Target Lab, we influence the spin polarity of TEMPO doped targets in a cryogenic environment with a strong magnetic field (~5 Tesla) and microwave amplification. This cryogenic environment must be under vacuum and controlled through the presence of liquid nitrogen in the target area and thermal regulation along the fridge.

My research was to test the viability of adding a heating element within the fridge and the development of TEMPO doped Araldite targets. The purpose of the heating cartridge was to vaporize the liquid helium venting from the lower portion of the fridge, thus preventing it from harming the O-rings and shells located above. TEMPO doped targets would be used as a material to test and measure spin polarization.

Slifer Revision

The University of New Hampshire Nuclear Particle Physics Group uses nuclear targets with enhanced spin polarization in their research program. In the Slifer Polarized Target Lab, we dynamically enhance the polarization of chemically doped proton rich targets in a cryogenic environment with a strong magnetic field (~5 Tesla). Microwaves near the electron spin resonance are used to induce transitions which flip both the spin of the electron and that of a nearby proton. A liquid helium refrigerator is used to reach temperatures of 1 Kelvin in the target region.

My research has been to test polarizable proton rich target material for use in our DNP polarizer. I will present results for Araldite, mechanically mixed with the stable titroxyl radical Tempo (2,2,6,6-Tetramethylpiperidine 1-oxyl) which we polarized to the highest level of all materials yet tested. The small Tempo admixture provides the paramagnetic radicals necessary for dynamic nuclear polarization technique. I also installed a PID controlled heating element in the helium evaporation refrigerator in order to regulate the cryostat temperature. The heating element worked well and proved important to prevent overfilling of liquid helium which can cause catastrophic failure of the target vessel vacuum.