Update on GEn-II with Thesis Outlook

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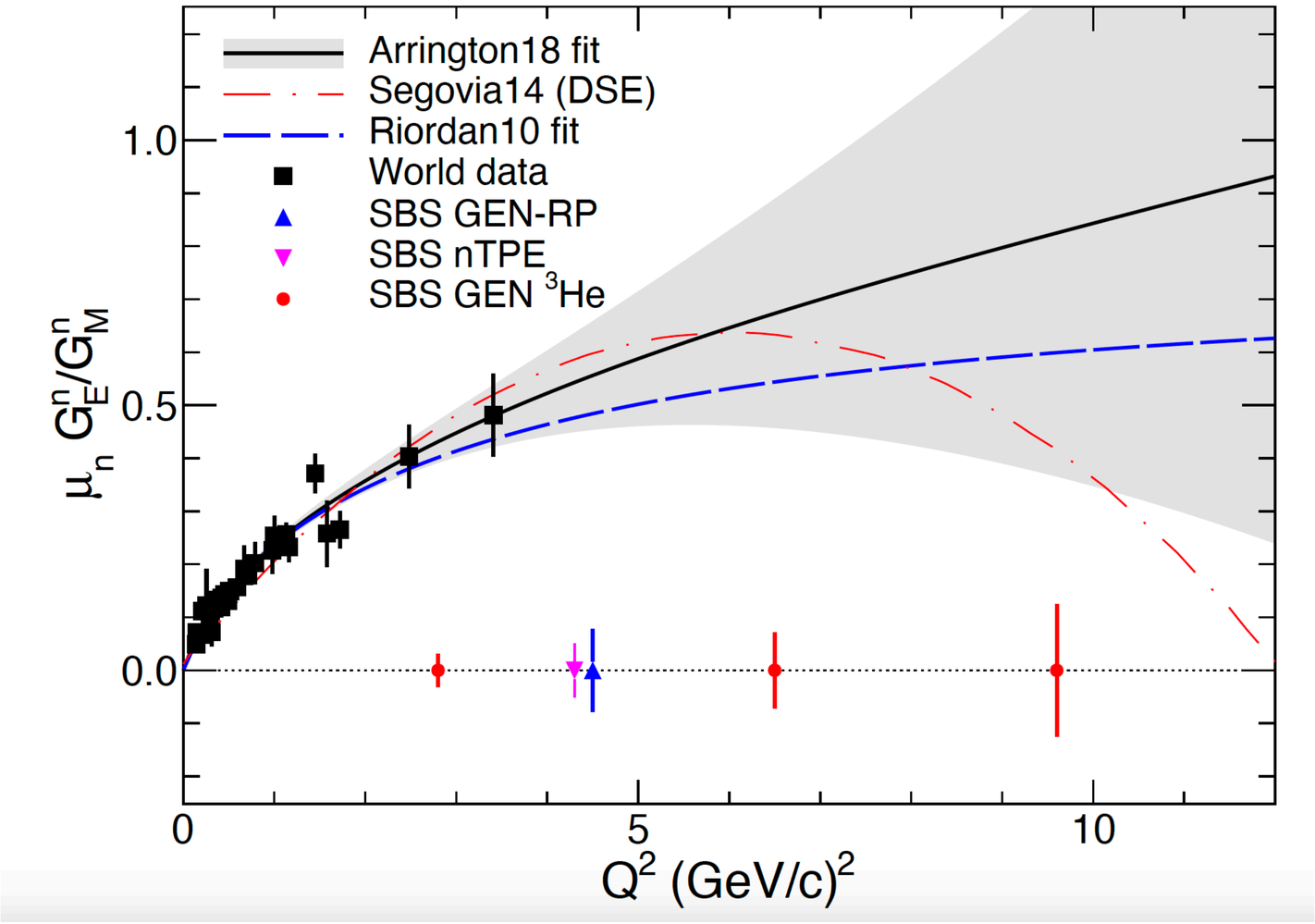
July 17, 2023

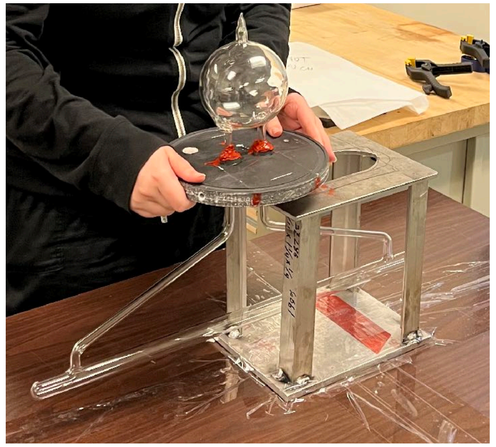
WILLIAM & MARY
CHARTERED 1693

Jefferson Lab

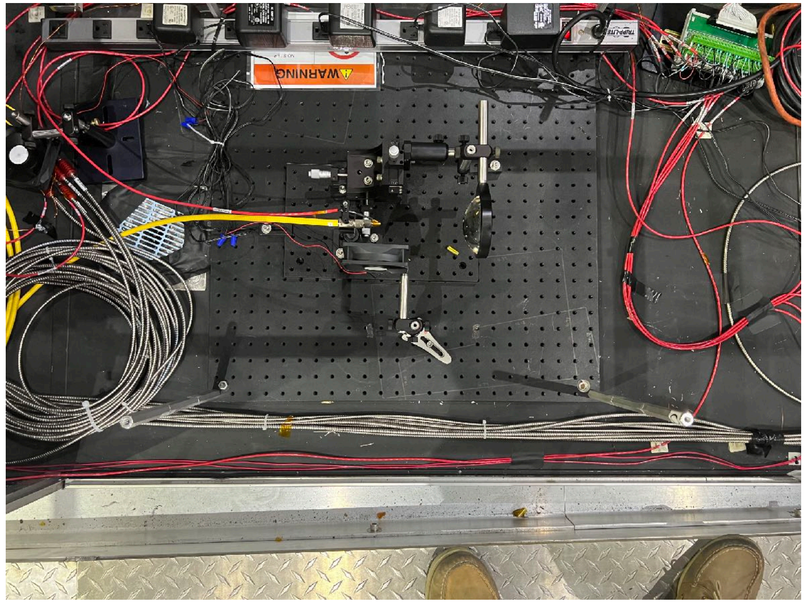
GEn-II Hall A

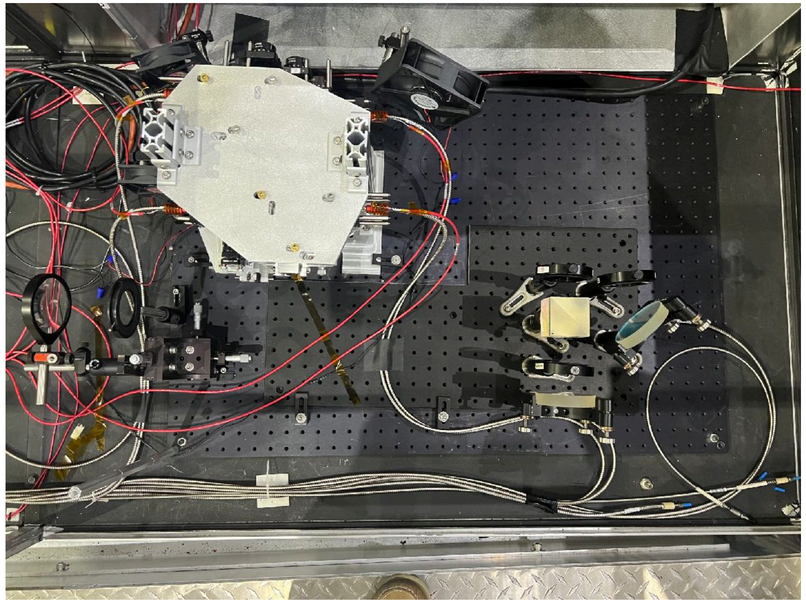

Arrington18 fit
Segovia14 (DSE)
Riordan10 fit
World data
SBS GEN-RP
SBS nTPE
SBS GEN ^{3}He
$\mu_n G_E^n/G_M^n$
1.0
0.5
0.0
0
5
10
Q^2 (GeV/c)^2

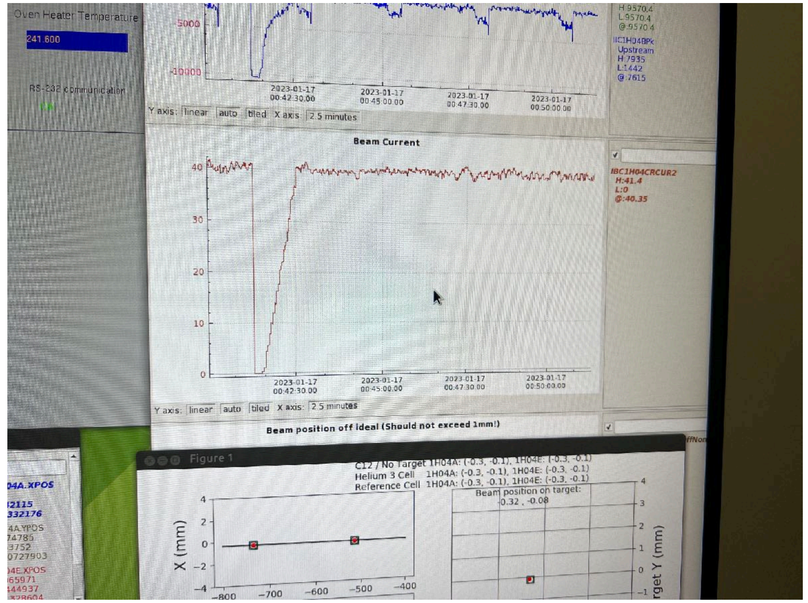
Experiment Work Overview



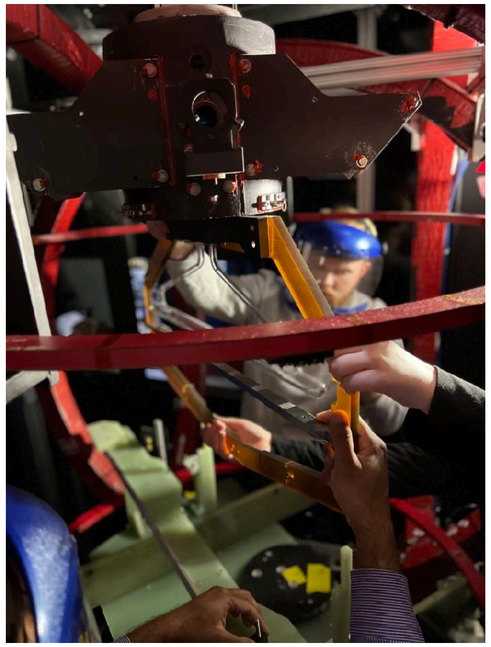
- New GEn-II cells: larger, new mounting technique
- Lasers: More power
- Optics: Pump from opposite sides of the cell
- Shifts

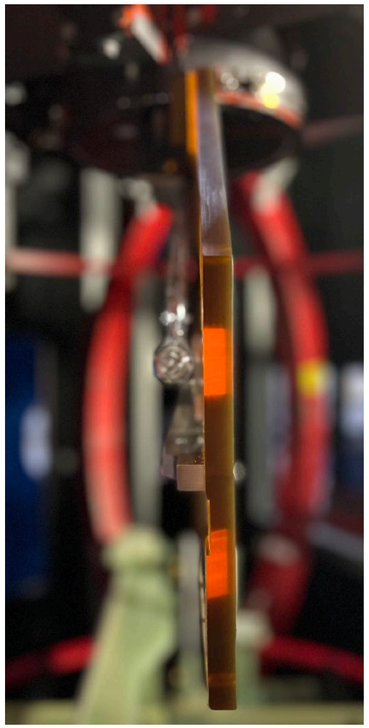






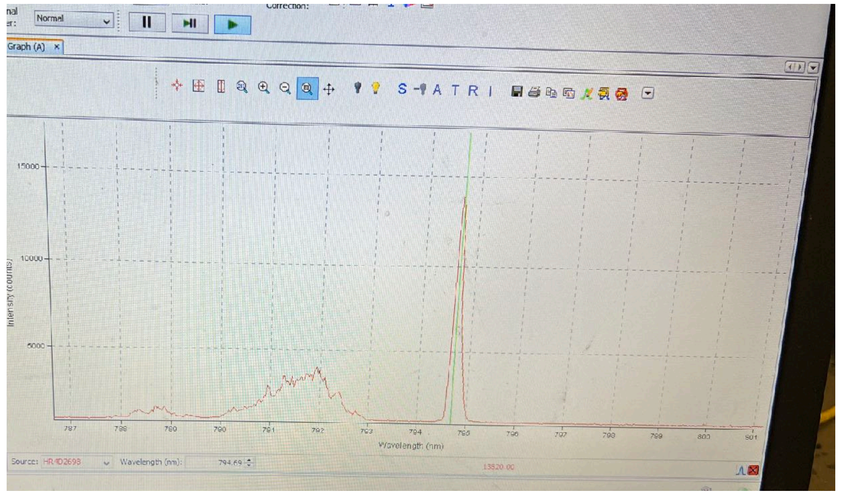
Target Installation

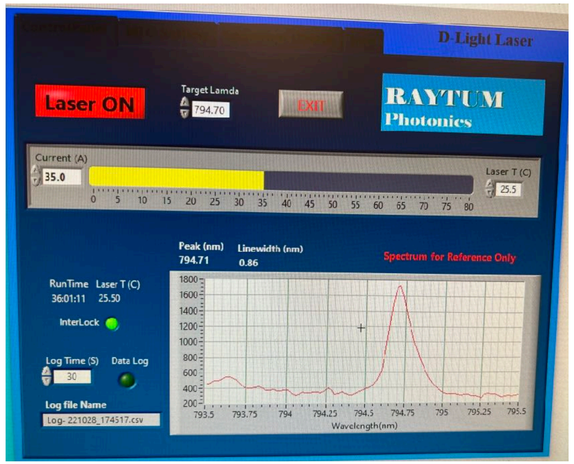


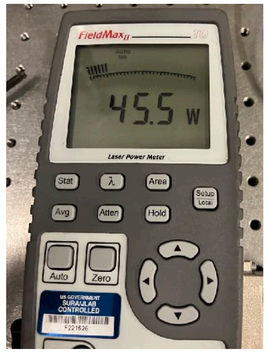


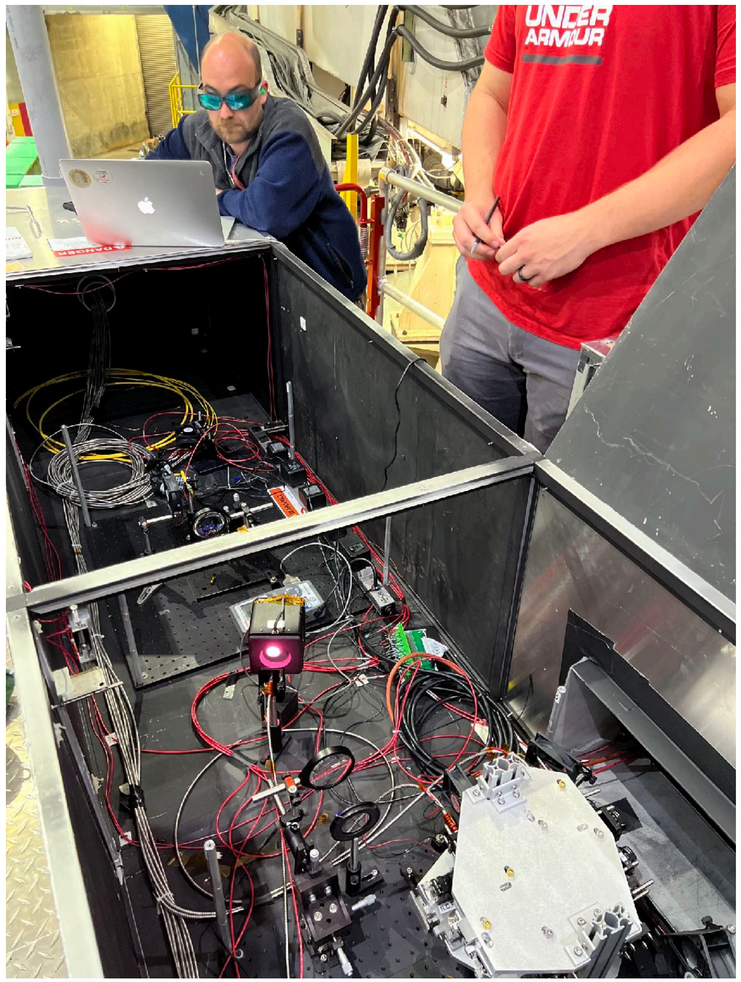
- Each student trained for target install
- All new parts (jig, oven, ladder, etc.)
- Practice, focus, & being deliberate

Target System: Lasers





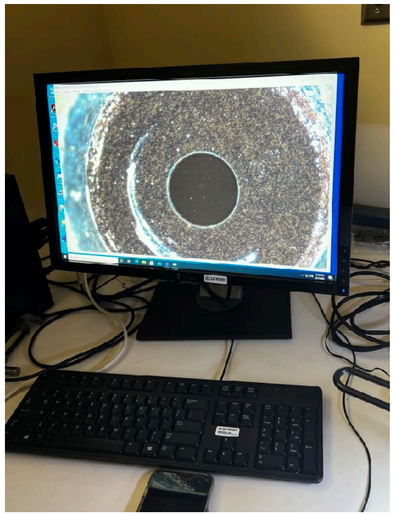




- Tuning
- Power tests
- Fiber optic cables
- Polarization Measurements
- Optics setup
- Periscope mirrors

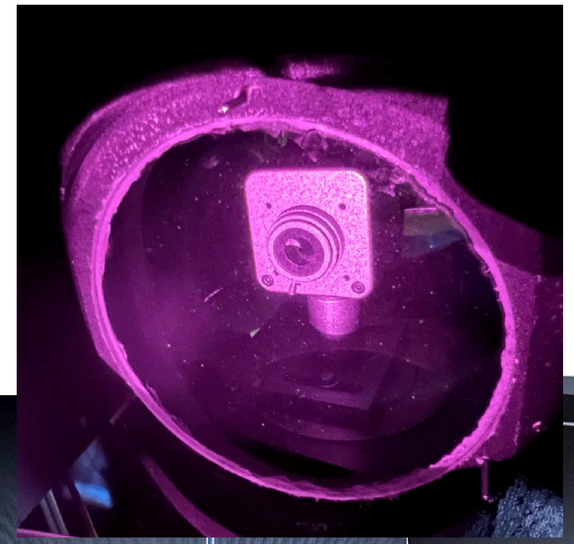
Target System: Fibers

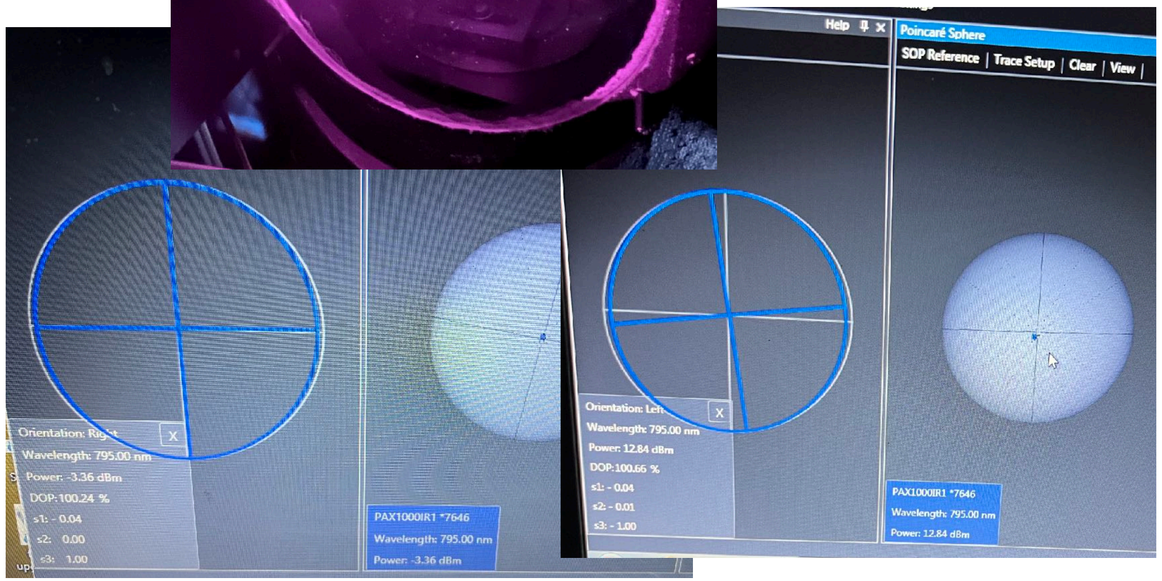
- Fiber tip length measured & matched
- Core concentricity measured & matched
- Ends examined visually
- Cables bundled & run in the hall

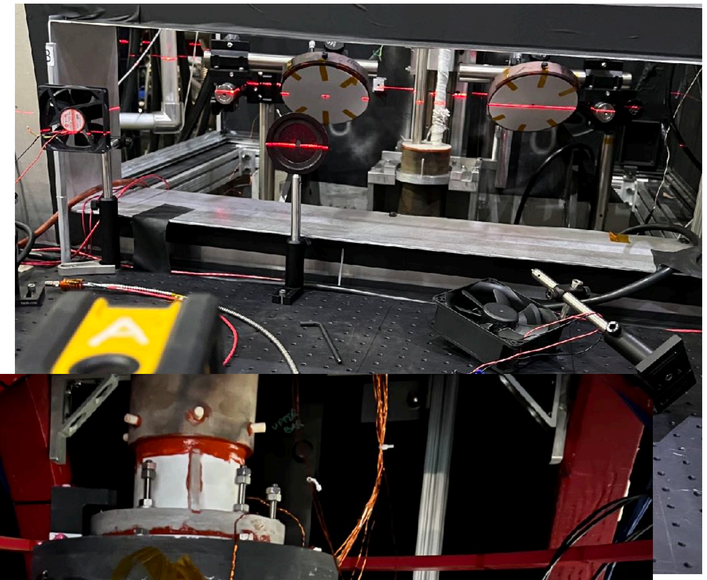


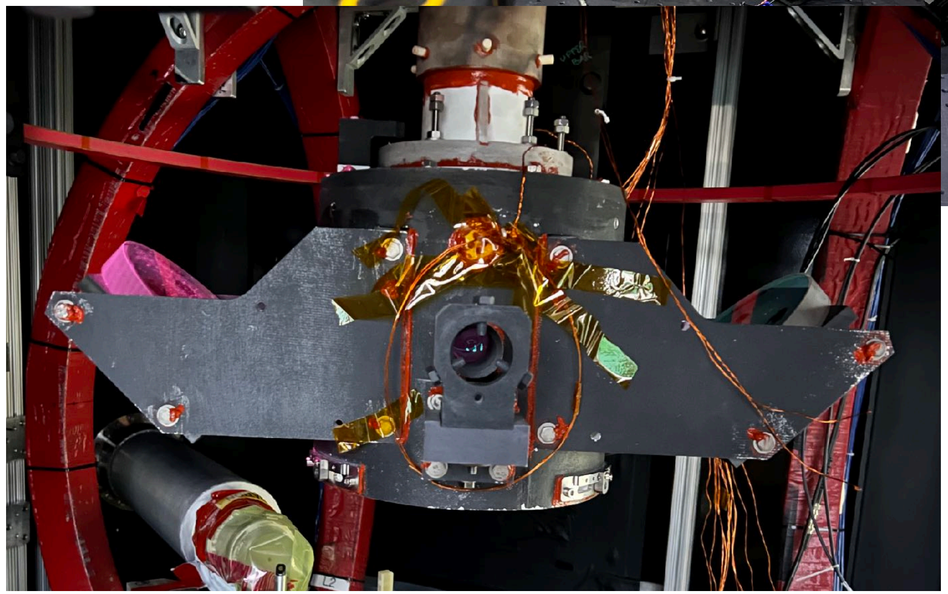
Target System: Lasers

- Laser polarization measured >99.4%
- UVA: RHP JLab: LHP
- Down periscope setup into oven



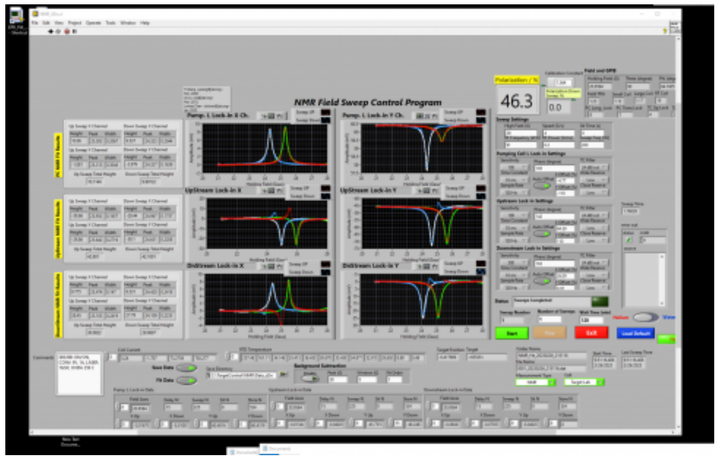


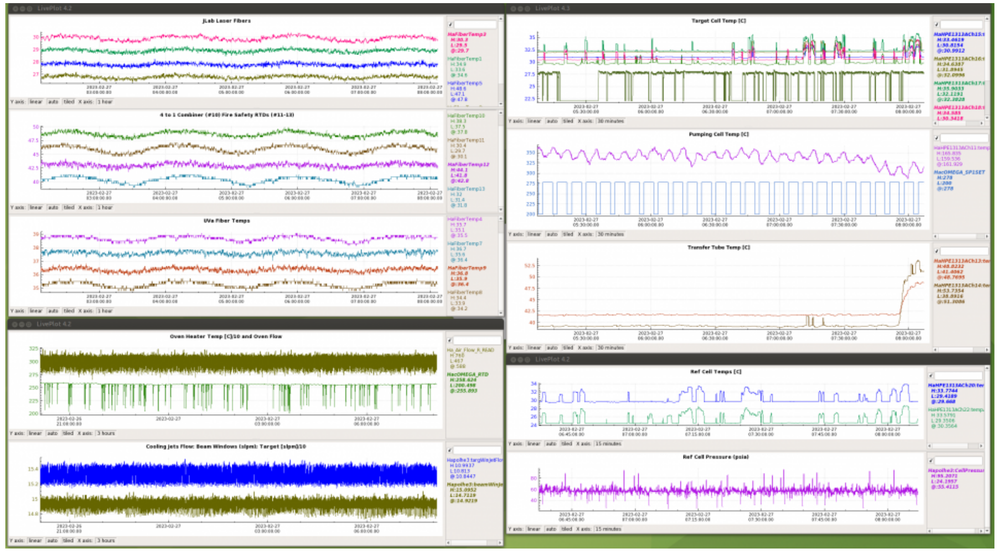


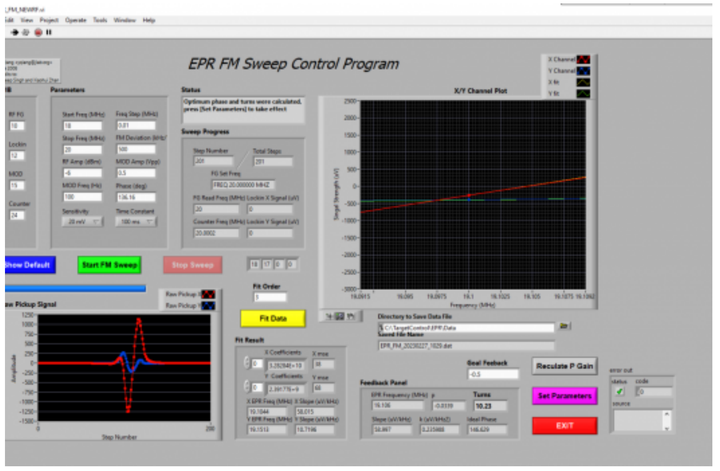


Other Work

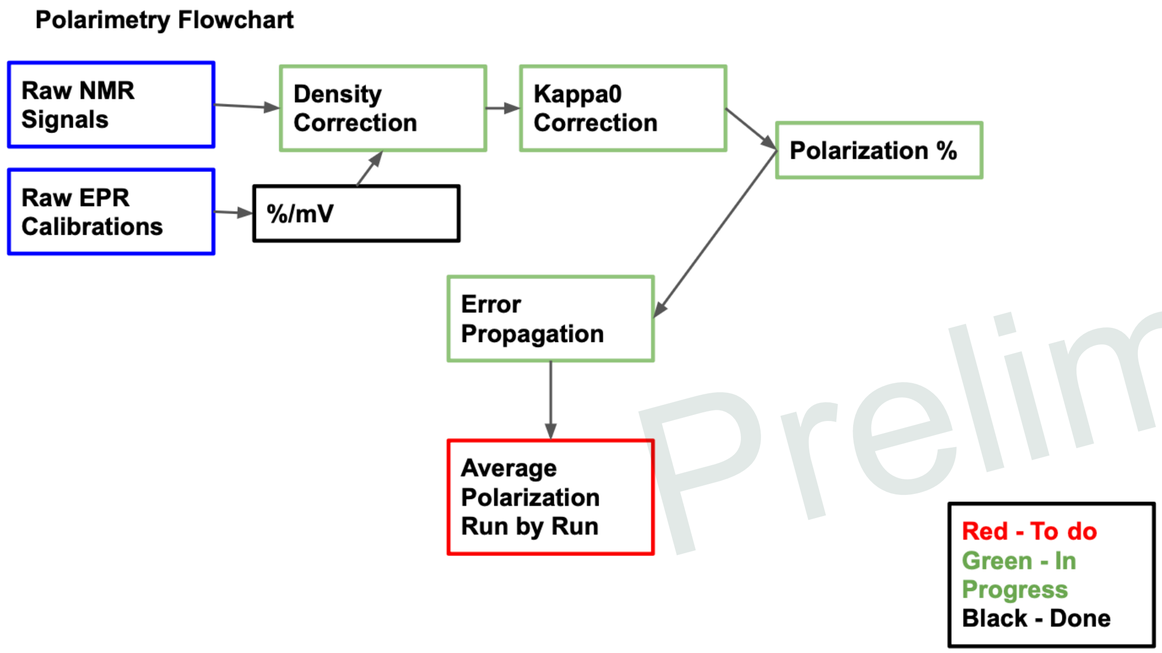
- Target expert on call
- Came in to diagnose issues (Lasers crash, NMR)
- NMR and EPR measurements
- Most weighted shifts







Target Analysis



Data Analysis

Analysis Checkpoints from GEn-I paper

1. Calibrations and resolutions of detectors using pass0, pass1 etc data for various kinematic settings
   a. Raster (Sean), Optics (Sean), HCal (Hunter), BBCal (Kate), GEMs (Sean), GRINCH (Jack), Timing Hodoscope (Gary), Beam helicity on an event-by-event basis (Faraz)
   b. Magnetic Field direction and magnitude measurements and calculations for all 4 kinematic settings (Bogdan/Bill/student?)
2. Data Quality Checks
3. Data Selection
   a. Optimization of all analysis cuts: proton spot on HCAL, fiducial cuts, P_perp and W cut etc
4. Raw Asymmetry
5. Corrections
   a. Polarizations
      i. Beam polarization (Faraz)
      ii. Target Polarization (Hunter/Jack Jackson)
   b. Physics Corrections
      i. A^p_meas and A^a_meas (parallel and anti-parallel)
      ii. A_en
      iii. Target dilution factor for N2 content in the PolHe3 cell
      iv. Dilution factor for background
      v. Correction for single pion contamination leading to A_QE
      vi. Dilution for inelastic events from MC simulations gives A_en/exp
      vii. Dilution factor for protons from upstream of the veto planes??
      viii. Asymmetry A_ep for protons in He3 from Generalized Eikonal Approximation calculations by Misak Sargsian
         1. Spin dependent final state interactions
         2. MEC (Meson Exchange Current) calculations
   c. Other Corrections
      i. Beam energy with scaling factors (Provakar's help)
6. Physics Asymmetry
   a. Calculation of different quantities such as W, Tau etc.. (everyone)
7. Error Analysis
   a. Statistical Error
   b. Systematic Error
8. GEn
   a. Obtain GMn for the GEn Q2 values
   b. Obtain gn, F1d/F1u, GEn/GD etc

Summary

- GEn is difficult
  - Intricate sub-systems
- Target Expert
- Need take SL to gain knowledge about entire experiment
- Gain more experience with software
- Target analysis + Data Analysis
- Tentative thesis finished June 2025