Target Analysis Update for G_E^n Collaboration

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OUTLINE

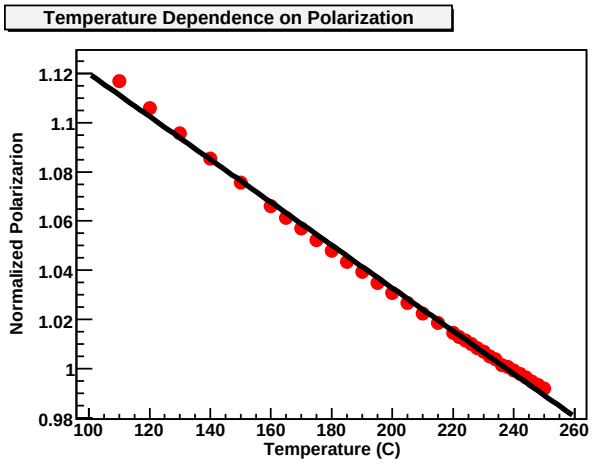
- Project introduction
- Method and results
  - Difficulties
  - New Method
- Plans for final results
- How this applies to the larger analysis

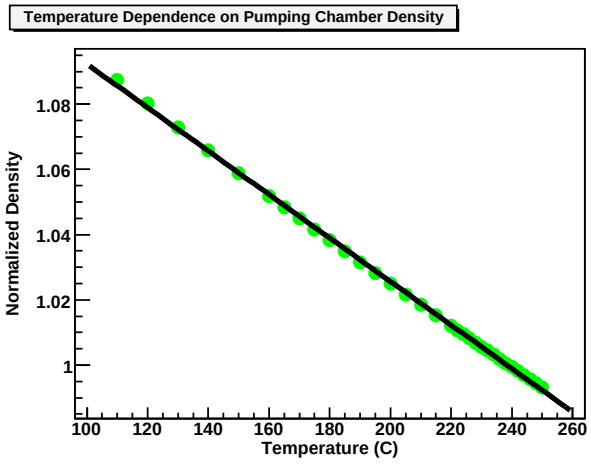
Introduction

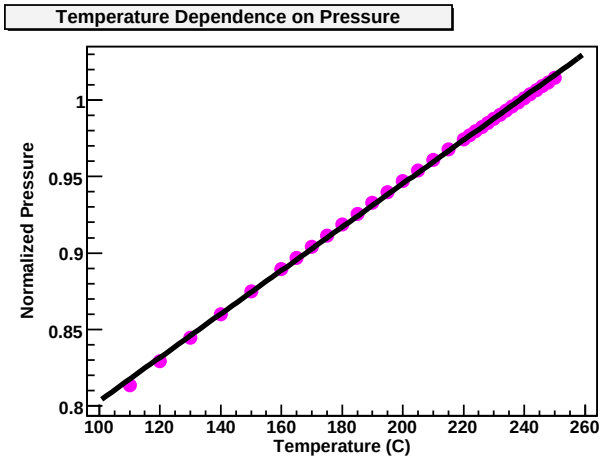
The polarization number that we quote is sensitive to the temperature in the pumping chamber.

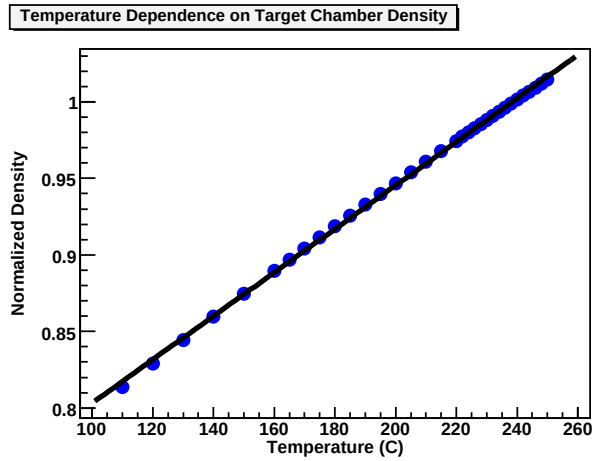
A few degrees shift can result in a few percent shift in measured polarization

Biggest uncertainty comes from impact of lasers.


Temperature Dependence on Polarization
Normalized Polarizarion
Temperature (C)
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
100 120 140 160 180 200 220 240 260


Temperature Dependence on Pumping Chamber Density
Normalized Density
Temperature (C)
1.08
1.06
1.04
1.02
1
100 120 140 160 180 200 220 240 260

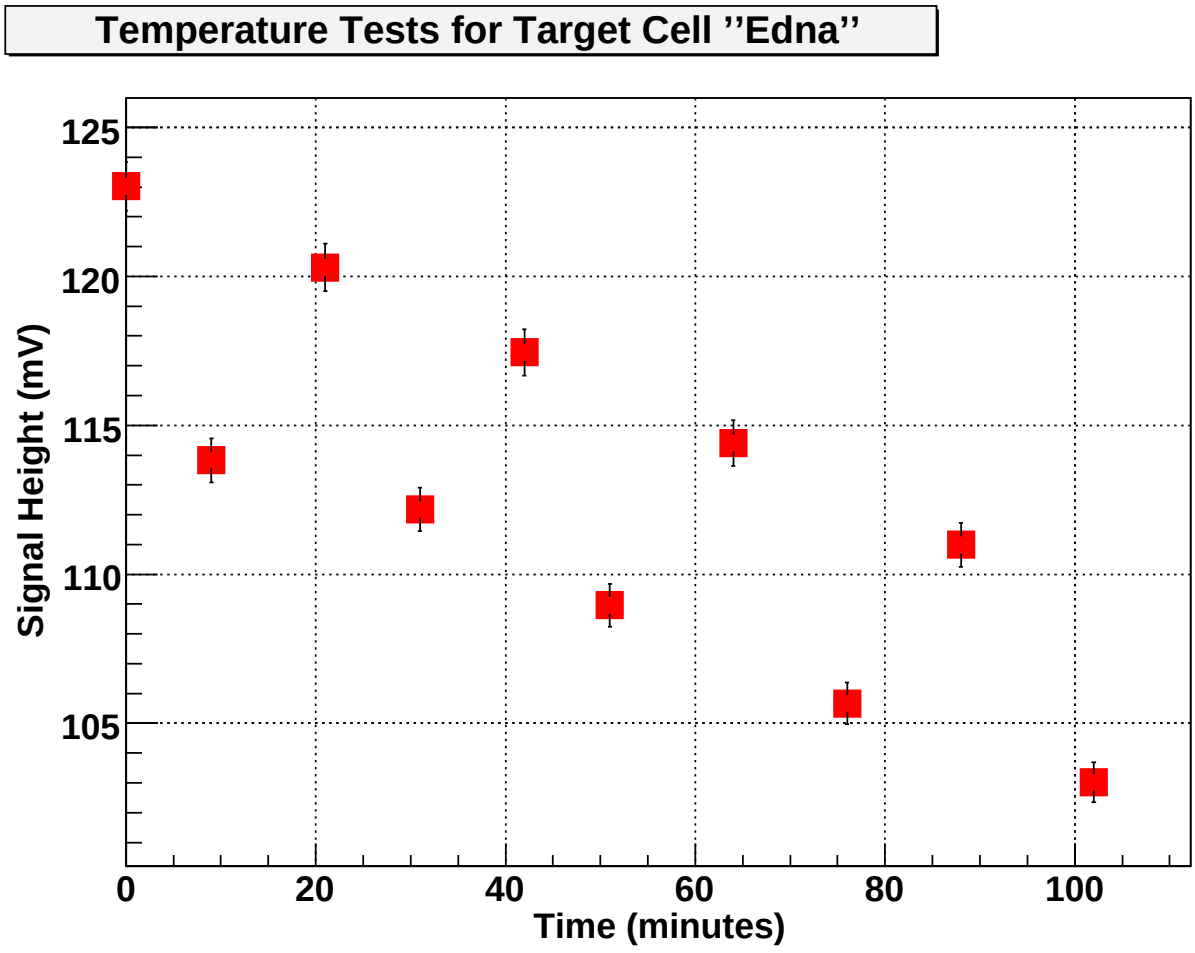

Temperature Dependence on Pressure
Normalized Pressure
Temperature (C)
1
0.95
0.9
0.85
0.8
100 120 140 160 180 200 220 240 260


Temperature Dependence on Target Chamber Density
Normalized Density
Temperature (C)
1
0.95
0.9
0.85
0.8
100 120 140 160 180 200 220 240 260

Method

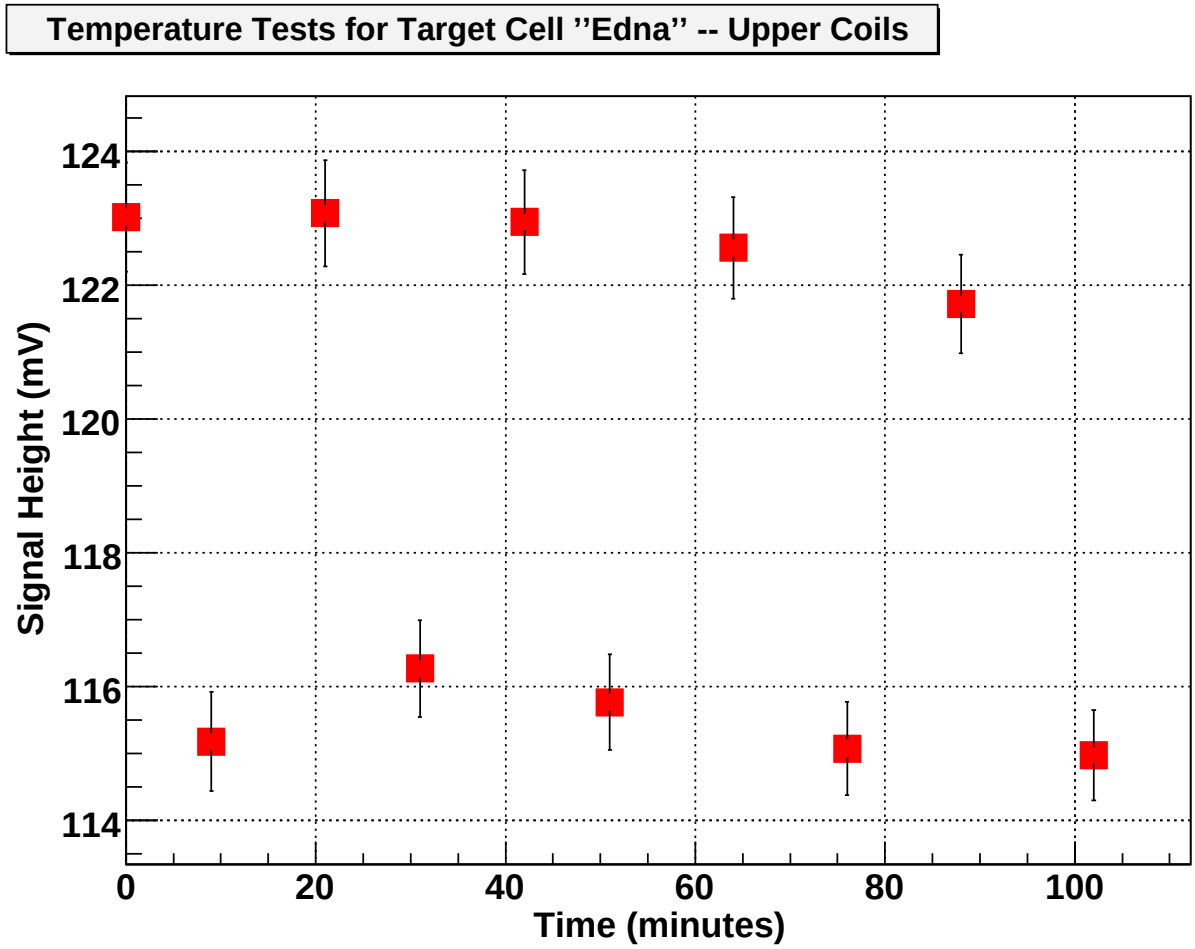
The method:

- Take series of measurements with lasers on and lasers off



Method

- Correct the signals for AFP losses



Method

- Use a simple relationship to find the true value with the lasers on

$$S \propto n_{tc} = \frac{n_o}{1 + \frac{V_{pc}}{V_{tot}} \left(\frac{T_{tc}}{T_{pc}} - 1 \right)}$$

We get: $T_{pc}(lasersON) = 248.28°C$

Compare to a measured $T = 242.96°C$

Giving us: $\Delta T = 5.32°C$

Method

Difficulties

This is the result for:

- Edna
- with 4 lasers

We have 2 other cells and varied the number of lasers greatly.

Method

New Method

We have data from the upper coil.

Cannot extract information exactly (yet). CAN use ratio of ratios.

It can be shown that:

$$\frac{R(T)}{R_0} = \frac{1 + \frac{V_{tc}}{V_tot}\left(\frac{T_pc}{T_tc} - 1\right)}{1 + \frac{V_{tc}}{V_tot}\left(\frac{T_pc}{T_tc} - 1\right)}$$

From this can extract proper temperature for ALL measurements!

Provided that we have:

1. double coil measurements

2. cold double coil measurements

Plans for Final Results

(and next step)

1. Cross check new method with previous method (2 days)

2. Check other cells and different laser numbers for sanity (2-3 days)

3. Give Nerses feedback on target EPICS variables (simultaneous w/ 2)

4. begin next project (either flux, polarization diffusion, or magnet lag)

Larger Analysis

- Can replay EPR measurements with proper temperature

- Can density correct odd NMR measurements.

- Beginning to assign correct error to measurements