

# Duality Water Analysis

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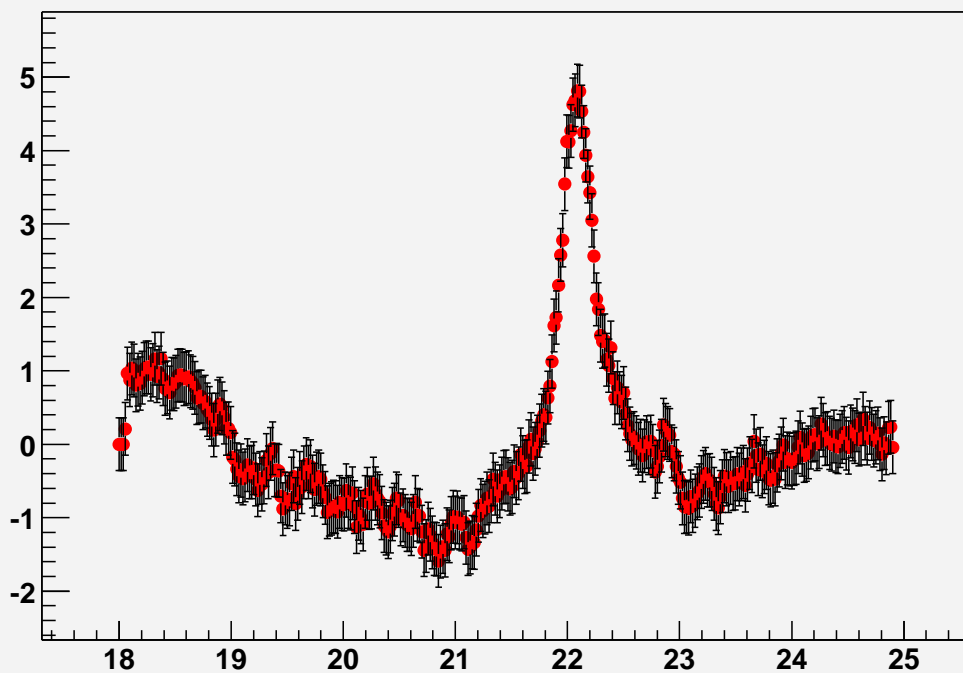
Pol.  $^3\text{He}$  Collaboration Meeting

May 21<sup>st</sup>, 2004

## Calibration Summary

- Pre-experiment no good water calibrations
- Post-experiment 6 water calibrations
  - First three, target lifting motor caused significant background noise
  - Last three, lifting motor unplugged
  - For the last two, A- $\phi$  box was used
  - A- $\phi$  box caused distorted wings, or did it?

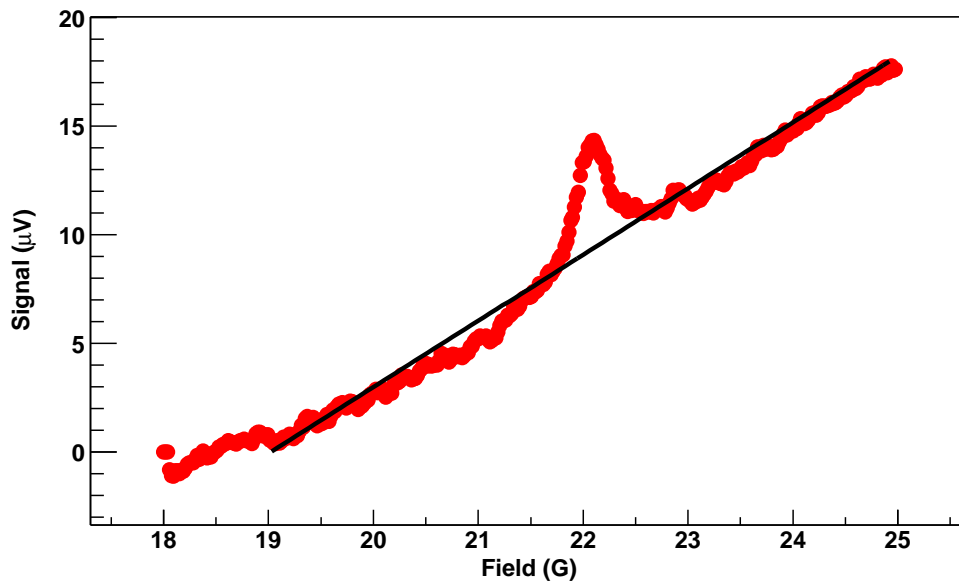
X Down sweep - 17 Feb 2003 - 100x 40cm (circuit)



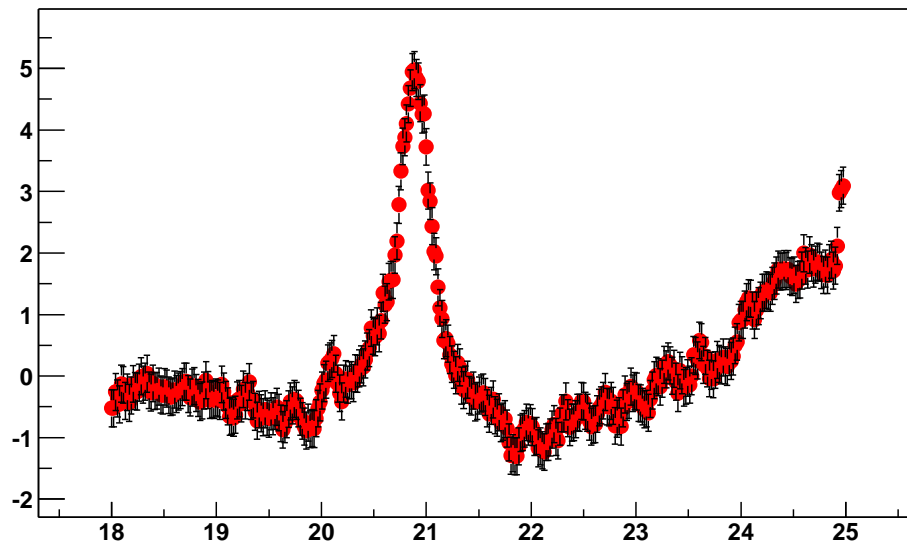
## Analysis Progress

- Began analysis using a linear background (some progress)
- Moved to quadratic background (more progress)
- Looked at raw signal before linear background subtraction
  - Wing behavior caused by subtracting background from a signal with a large slope.
  - Background studied by using different order polynomial fits.

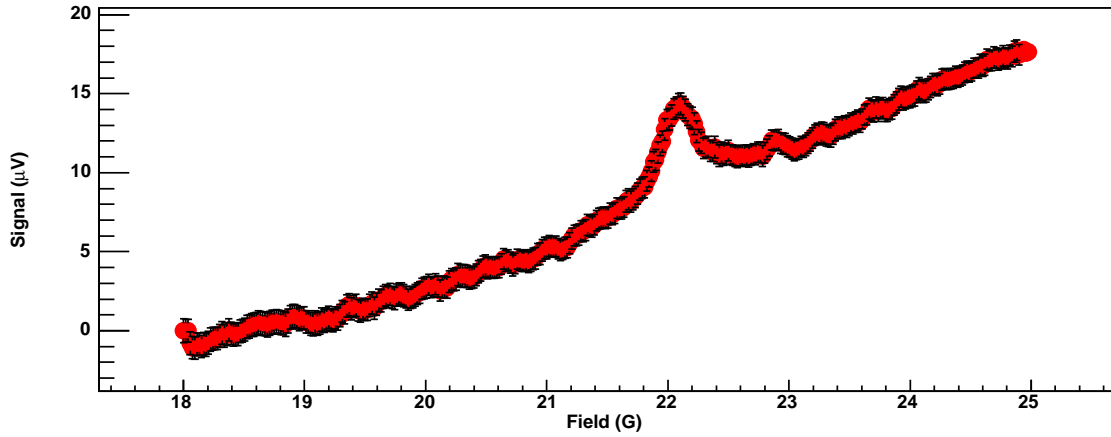
X Down sweep - 1st 17 Feb 2003 - 100x



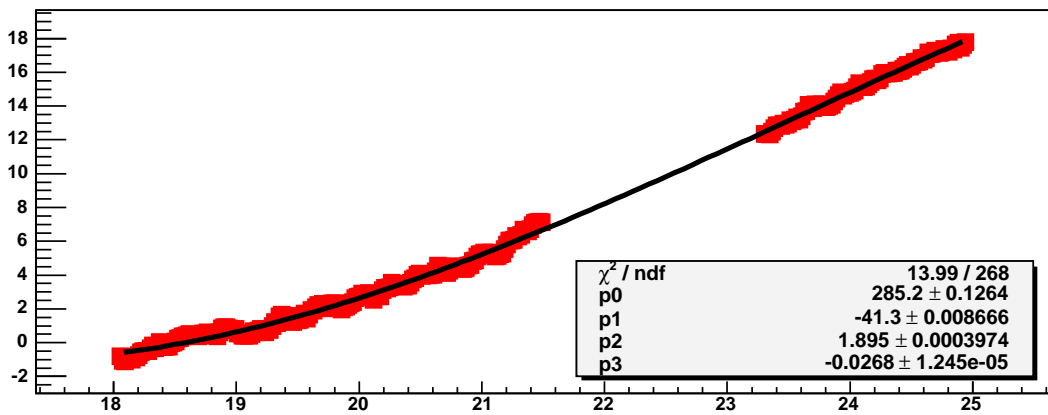
Residual - 1st 17 Feb 2003 - 100x



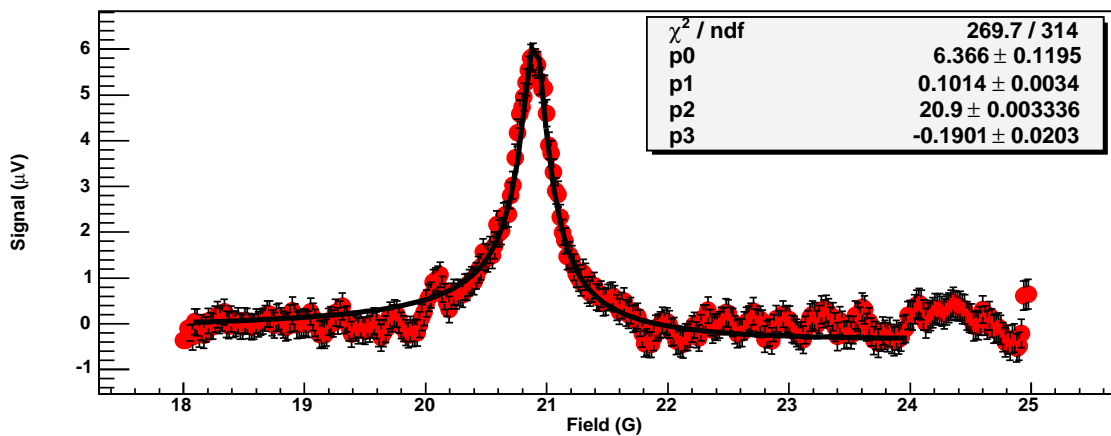
X Down sweep - 1st 17 Feb 2003 - 100x



Graph



Residual - 1st 17 Feb 2003 - 100x

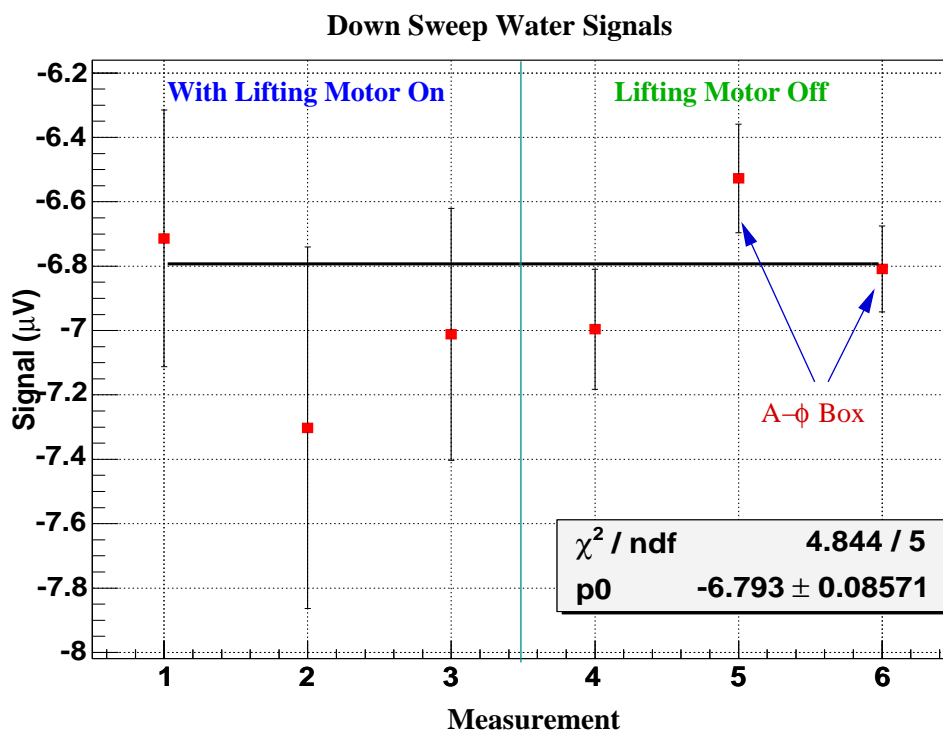


## Analysis Results

Date	Fit Order	Signal ( $\mu\text{V}$ )	$\chi^2/\text{NDF}$
02-16-03-2	1 <sup>st</sup>	$-6.765 \pm 0.163$	1.39
	2 <sup>nd</sup>	$-7.096 \pm 0.153$	1.09
	3 <sup>rd</sup>	$-6.996 \pm 0.157$	0.95
	4 <sup>th</sup>	$-7.083 \pm 0.156$	0.81
02-17-03-1	1 <sup>st</sup>	$5.926 \pm 0.109$	3.24
	2 <sup>nd</sup>	$6.494 \pm 0.101$	0.89
	3 <sup>rd</sup>	$6.366 \pm 0.120$	0.86
	4 <sup>th</sup>	$6.400 \pm 0.105$	1.11
02-17-03-2	1 <sup>st</sup>	$6.389 \pm 0.092$	2.99
	2 <sup>nd</sup>	$6.653 \pm 0.127$	0.96
	3 <sup>rd</sup>	$6.689 \pm 0.126$	0.86
	4 <sup>th</sup>	$6.675 \pm 0.126$	0.85

## Background Status

- First order polynomial fits are poor.
- Second through fourth order fits are within  $\sim 2\%$  of each other.
- Chose results using  $\chi^2$  and fit quality comparisons
- Used fit differences from different polynomial fits as an estimate of the systematic error
- **A- $\phi$  box signals still systematically smaller** than non A- $\phi$  box signal



# Summary

## Summary

- Wing behavior caused by subtracting background from a signal with a large slope
- Need tests in Target Lab to understand the signal effects from the A- $\phi$  box
- $^3\text{He}$  NMR refit.

## Plan

- Test affects of A- $\phi$  box to understand the systematic affects
- Finalize water signal uncertainty
- Study NMR signal shape (lock-in time constant, gradients, etc.)
- Finalize flux error bars
- Compare NMR and EPR calibrations