

TRANSVERSITY
Target Lab. Update

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Transversity Collaboration Meeting
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OUTLINE

- Last collaboration meeting “issues” .
- EPR improvement.
- Spin Flip Test.
- New oven installation and other issues.
- Things to do before the readiness review.

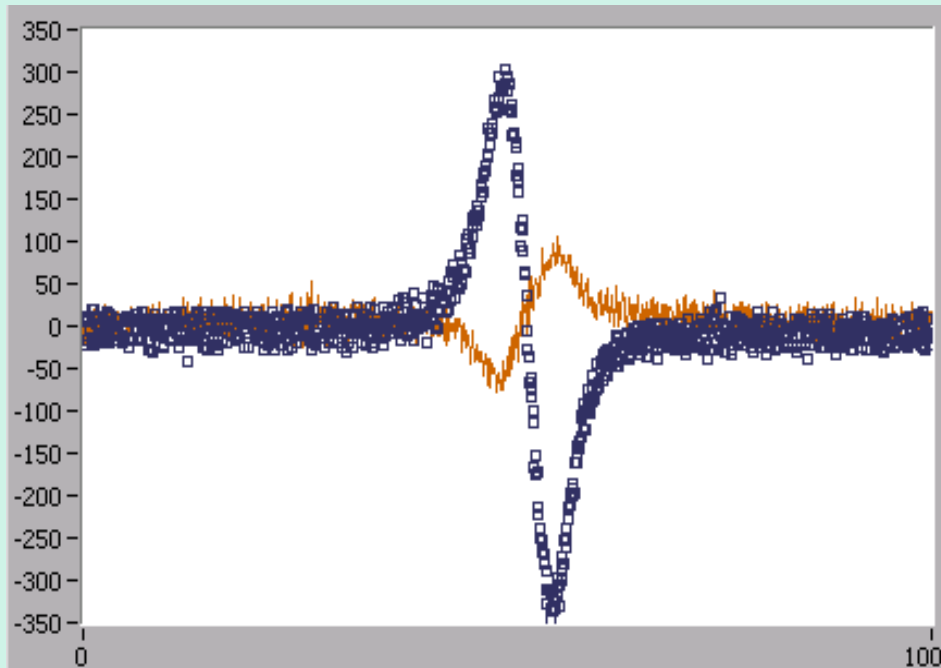
SOME of the issues from the last collaboration meeting

- ^3He NMR (Field / Frequency Sweep)—done successfully.
- EPR—needed improvement.
- Water NMR(Field Sweep)—needed a lot of improvement.
- Spin Flip (with two lasers)—to be tested extensively.

(All tests were performed with “Carlos”)

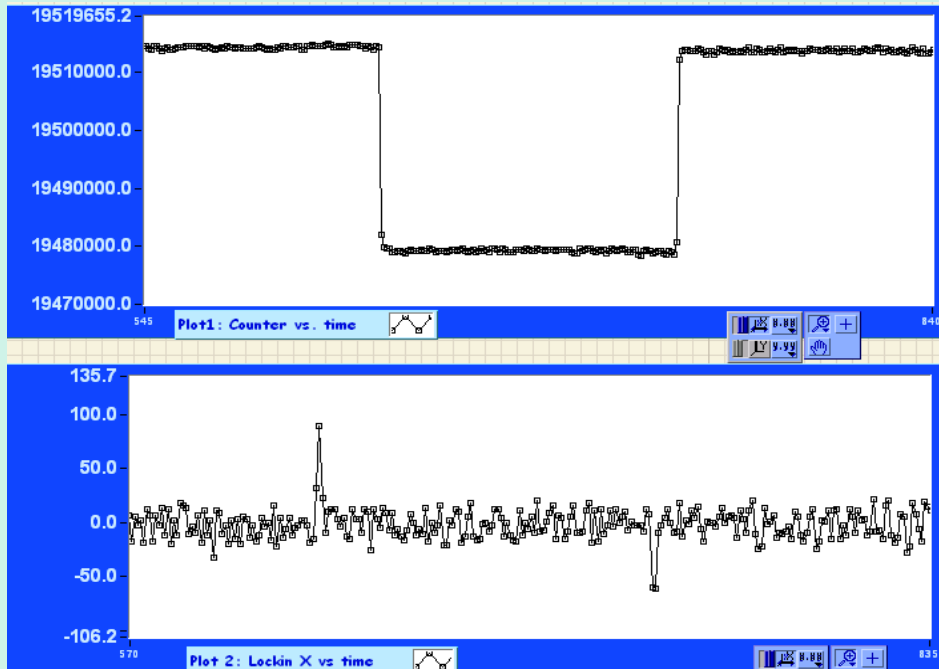
EPR improved !

- Done with 2 lasers @30 W each and at oven temp. 230°C
- Frequency Lineshape :: The resonance is at 19.50 MHz



EPR improved !

- AFP ::



SPIN FLIP

- Plan to measure SSA in $n^{\uparrow}(e, e'\pi^{-})X$
- SSA can be defined roughly as $\frac{d\sigma^{\uparrow}-d\sigma^{\downarrow}}{d\sigma^{\uparrow}+d\sigma^{\downarrow}}$
where
 $d\sigma^{\uparrow}$ is the cross section when the spins are polarized transversely with respect to the beam and $d\sigma^{\downarrow}$ is the cross section when the spins are flipped 180°
- Need to flip the target spins at regular intervals in such a way that the systematic errors could be reduced.

SPIN FLIP TEST

- Expected Loss from theory :::

$$\frac{P_e}{P_{max}} = \frac{e^{\frac{T_w}{T_u}} - 1}{e^{\frac{T_w}{T_u}} - (1 - \delta)} \quad (1)$$

where

P_e = Polarization @ equilibrium.

P_{max} = Maximum polarization before spin flip process.

T_w = Wait time between two consecutive sweeps.

T_u = Spin up time for our target.

δ = AFP loss per sweep.

SPIN FLIP TEST

- Done with 2 lasers @ 30W each.
- Tests performed with 10 min, 15 min and 20 min wait time.
- Struggled at the beginning and huge inconsistency observed between the expected loss and the experimental loss !!
- The problem was well identified. The resonance frequency was not at the middle of the scanning range.
- As a result, spins were not completely flipped in the process.
- Now with the change in the range while keeping the sweep rate fixed, the problem is solved !

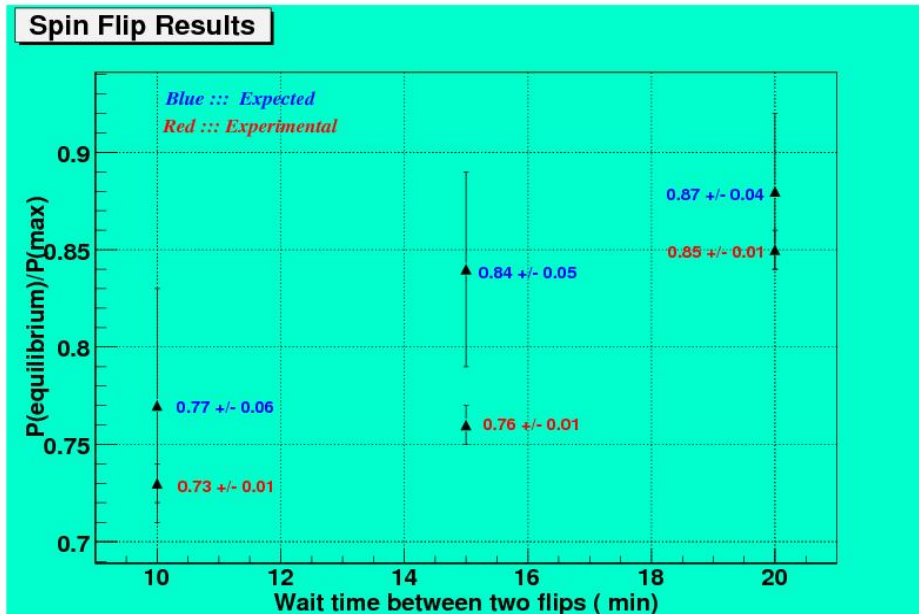
SPIN FLIP TEST

- The resonance frequency was @ 84.5 KHz instead of @ 81 KHz.
- The sweep range 77–85 KHz was not enough !
- The new sweep range 76–88 KHz seems to solve the problem.



SPIN FLIP RESULTS

- The experimental results in our lab. ::
- $\delta=0.005$ and $T_{up}=578$ min. for “Carlos”

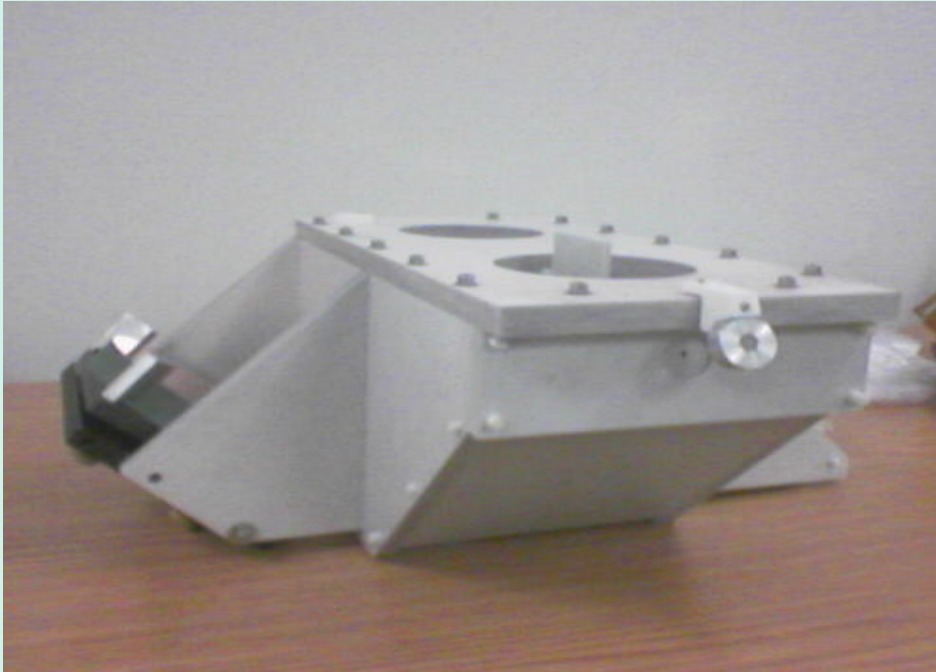


New oven installation/other issues

- The new oven is already done and in the lab. right now.
- Joe is taking care of that mainly.
- Xiaohui is working on some of the software issues regarding the spin flip as well as the other tests.
- Vertical Compass design in progress.
- The first set of drawings will be put in the workshop this week.(from Wolfgang)

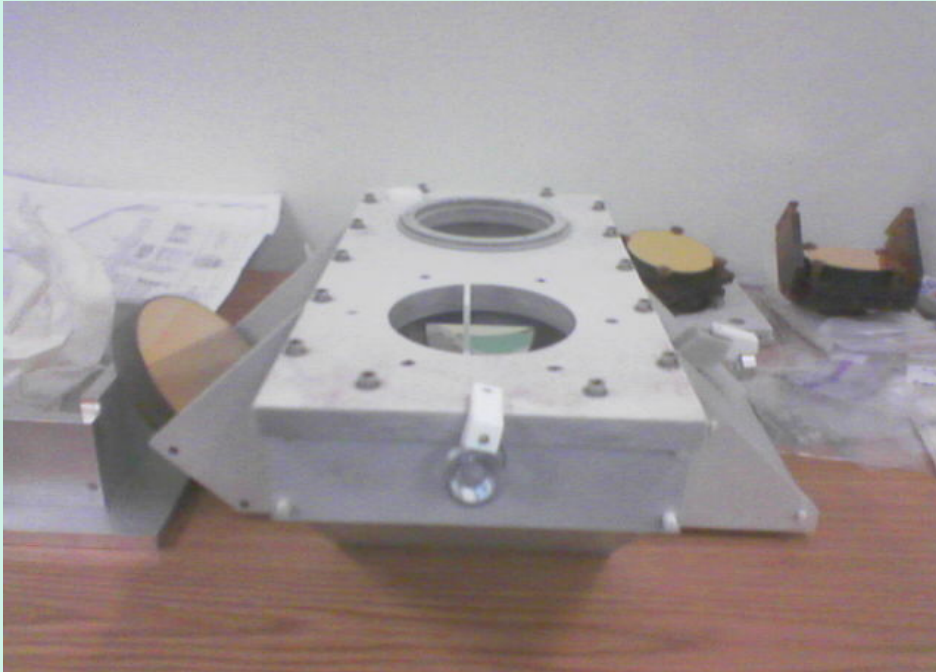
The new oven

- Pic taken by Joe ::



The new oven

- Pic taken by Joe ::



The new oven

- Pic taken by Joe ::



Things to do before the readiness review

- **New oven to be installed and tested.**
- **If everything goes fine, then all other tests to be done from the beginning with this new oven.**

Long term plan :::

- **Water NMR –both field and frequency sweep !**
- **Cell characterization .**
- **Other Target related software developement.**

To conclude

I would like to thank Wolfgang Korsch, J P Chen, Jaideep Singh, Xiaofeng Zhu, Huan, Joe Katich and Xiaohui for all their support .
And any comments, suggestions to improve the target related work are welcome from everyone.

Thanks !