**Minutes from n3He Alignment Meeting**

Compilation done by

C. Hayes

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Errors are ours

Attendees:

Jack Thomison

Chris Hayes

Seppo Penttila

Geoff Greene

Dave Bowman

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Mark McCrea

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On phone:

C. Crawford

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Date: 05/01/2014

Place: SNS bldg 8630

Scope:

A goal of the alignment meeting was to discuss procedures on how to align the n-3He experiment to beam and how to measure and align the magnetic field. Another goal was to discuss in detail how to support the different components of the apparatus. Status of the designs and design ideas were considered.

Summary of issues discussed:

1. The vertical four channels of the existing NPDGamma magnetic field frame need to be bolted tightly to the cave ceiling. The bolts are in place but need to be pushed against the steel ceiling.
2. The steel on floor is not stable. An idea to stabilize it is to load it again as it is loaded now with the equivalent of one metric ton of CsI pushing it. As a weight we can use the 2nd lead wall that will be taken down and mount it on the floor. However, more weight is required. Either we need to add steel plates or have available fresh lead bricks to be manufactured for Nab.
3. We have an advanced design for the attachment of the 18 coils of the solenoid field. The base structure is two long channels that are clamped to the NPDGamma coil frame. The design needs to be reviewed before going to fabrication.
4. Each of 18 B-field coils needs to be precisely held in place- to about 1 mm accuracy or so - with 4 mounts attached to channel rails. Also, we need to be able to recover the the position of the coils if they are moved. Jack showed pictures of two proposed designs for doing this. The U-bolt design is readily available (need 70) but may not be possible since coils need to be precisely placed. The other design will require machining of 70 identical parts. Chris C. promised to come up with alternative design.
5. Jack also showed pictures of table mounts to hold the spin flipper and ion chamber in place. It was decided to simplify the spin flipper mount to make it easier and less expensive to fabricate.
6. For beam scans two quality XY-tables are required with about 8 inches of travel. Chris Crawford is looking into finding appropriate scanners. He will send drawings so that design of table mounts and table supports can continue. Each scanner has to hold a cross hair, beam monitor, and monitor aperture. The dirty ADC box will be used to read M1 and M4.
7. How precisely does the 10 Gauss B-field need to be mapped. Field requirements are, dB\_z/dz less then 3% in the beam volume from the spin flipper to the end of the target, and the field directed in a few mrad along the beam. Chris H, showed ideas for how a V-channel and the flux gate from NPDGamma can be used for field mapping. A minimum field map should cover the length of the beam axis containing the spin flipper and the target. At least a few off axis measurements should be performed since the extra effort is minimal.
8. Chris H. presented a design for the laser mount. Design needs to include a provision for removing and replacing the laser beam with a kinematic mount.
9. Chris H. introduced rough sketches for a method to align the 10 Gauss field with the laser beam. Jack suggested it might be easier to find linear translator to accomplish this.
10. Discussion on alignment of ion chamber. Details need to be ironed out by Josh.
11. Discussion on rotation of ion chamber. We need to be able to rotate the chamber around its axis 180 degrees. This would require the 16 cables -2 cables per preamp box – to be reoriented so that the cables are coming out from coils radially.
12. Reviewed a plan for alignment of the experiment.
13. Find the beam centroid and get laser aligned with beam axis
14. Align the external B-field with the beam within a few mrad
15. Map the field, field homogeneity dB/dz less than 3%
16. Align the spin flipper with the beam
17. Align the ion chamber with the beam
18. Align the main collimator
19. Reviewed a plan for installation of the experiment at the beamline
20. Beam scan and alignment
21. Install coils
22. Install spin flipper
23. Install ion chamber with preamp boxes attached
24. All the assembly should be done with the coils in place with the provision that the coils may by moved out of the way if necessary.

Summary of actions:

1. Alternative attachment of coils to rails by Chris C. and Libertad
2. Finalize details for field mapping by Chris C.
3. Update laser mount design, include kinematic mount by Chris H.
4. Locate proper xy-tables with minimum 8” travel by Chris C.
5. Design mounts for xy-tables by Chris H. and Jack T.
6. Supports for xy-tables by Chris H. and Jack T.
7. Simplify the spin flipper mount by Scott Roy
8. Update ion chamber mount for more rigorous up/down motion by Josh H.

As a final note it was suggested that machine shop time be reserved at UT, ASU, and UK and also Manitoba – especially for the ion chamber - for the purpose of manufacturing the parts for installation.

Before we cut any metal we need to agree on the electrical grounding of components. The main issues are;

1. Since the chamber will be the defining ground for detection electronics, is it enough that the chamber is bolted to the Al support stand which is bolted to cave floor steel, which can be expected to form a good solid ground.
2. Power to the spin flipper is fed through a twin-ax BNC with a braided shield. The signal ground is defined by the audio-amp. The braided cable shield can be connected to the audio-amp chassis (which is grounded to AC power ground) and the spin flipper Al jacket which will float electrically. This option forms a continuous shield including audio-amp, cable and spin flipper Al shield. Another option is to bolt spin flipper down to rails as planned and then do not connect cable shield in preamp end. In this option we have two different chassis grounds—not so good.