FIELDMAPPER PROGRESS – WEEK ENDING 08/07/98

1 Magnet Meeting

Homero, Adam, Dan Markley, Russ, Gene, Rick Hance, Walt Jaskierny and Rich met to discuss magnet installation progress.

- Gene presented his draft "Commissioning and Run Plan" note. He shows the magnet commissioning (which satisfies the Director's Milestone) occuring in late September. His document outlines the work to be done during the commissioning, and beyond during the initial fieldmapping. All were encouraged to suggest appropriate revisions in a timely way so the document could be forwarded to John Cooper to "kick off" the Operational Readiness permit.

- Rick Hance outlined the readiness of his own subsystem – he has begun to fabricate the bus extensions and jumpers for the final connections to the control dewar. He noted the added elements can be tested before the magnet is commissioned. He has to connect the quench detection wiring from the control dewar to the power supply room, and complete the hookup of the hardware data logger.

- Russ Rucinski has whipped the cryo safety documentation into fairly good shape. All is ready to send to the panel except the FMEA tables, which will be done today. John Cooper must issue the Operational Readiness Clearance, and D will send its recommendations to him later in August. The welding of FJ1 was finished yesterday and FJ2 will be done today; vacuum pumping should start tomorrow. The leadflow jumpers will be done next week.

- Dan Markley will complete all cable pulling this week. Next week he will hook up the turbopump valves, and control dewar valves. The week of the 12th will see the vacuum instrumentation completed, and during the last week of August the data logging and graphics software will be tweaked.

2 Field Mapper Mechanical

- Adam and Homero completed the installation of the centerbeam in the fieldmapper and connected the control tube so the stepping motor could once again move it. The phi-caterpillar assembly cannot be reinstalled until the cable pulleys are back from shops. Likewise the z-caterpillar cannot be installed until the drag arm is received from shops.

- Rich reviewed Adam's first-moment calculations and noted that the spare brass rail was quite close to the proper counterweight if it was mounted on the z-caterpiller supports. He and Adam cut the rail to length and mounted it temporarily with duct tape. It balances the centerbeam (presently without the hall probe arm, cables, and caterpillars) adequately, and Adam moved the centerbeam (in phi) with the stepping motor. It accelerates and decelerates easily and moves nicely.

- Rich, Adam, and Homero "tuned" the rail system slightly to improve the carriage motion (with the plastic bearings installed). With a bit more tuning, the carriage will move flawlessly. There is very little "teeter" in the carriage, so the plastic bearings should be adequate.

- Adam and Rich worked out a method for installing the encoder rack, which is complicated greatly by the fact that the 10-inch long precision racks are not identical. This makes laying them end-to-end a matter of some complexity. Adam took the parts to MAB to obtain recommendations from Don and Dave about how to machine them at each end so they can be laid end-to-end precisely. Rich discussed the matter with Dave and Dave devised a method (using a segment from one as a fixture) to slightly undercut each one (at the bottom of the tooth patter).

- Rich laid out the length dimensions for the control tube and he and Adam devised a way to use the new larger-diameter (2 1/2 inch) tube telescoped onto the original 2-inch tube. The OD of the 2-inch tube must be reduced slightly to slide into the larger tube and Adam cut the desired length piece (3 feet long) and took it to MAB for the shopwork. Rich will lay out a new clamp flange for the new tube that mimics the old clamp flange, so the overall length of the control tube is adjustable and fits in the assembly pit at DAB.

3 Hall Probe Carriage

- Adam received several of the carriage parts from Don Carpenter; the encoder shaft cup was not completed and was sent back to shops. The cable gripper bracket, the hall probe arm bracket, and the encoder base and related fittings are ready for installation. The cable pulleys are now being done at PAB and are expected next week. The z-caterpillar drag arm is waiting for a welder.

- Adam and Homero presented their prelimary data for the behaviour of the encoder at the Wednesday meeting:

  At each magnetic field level they moved a rack and gear a set of increasing distances and fitted the slope of encoder counts vs. distance moved. Typically the slopes were all close to 1 (the scale factor in the readout unit was previously set so the unit gave 1.0000 counts for 1 inch of motion of the rack and gear. The plot shows the slopes do not differ a great deal from one another; they seem to show a tantalizing (small!) dependence on field, but the precision of the data is not well enough understood to ensure the slope variations are significant.

  Homero has greatly improved the encoder calibration mechanism and he and Adam have already repeated the measurements in IB1. They obtained more precise data and will present it next week.

4 Hall Probe Arm

- Pat has compelted the drawings for Miguel's design and sent them to the checker. Miguel and Rich will review the work so they can sign the drawings as soon as they are ready.

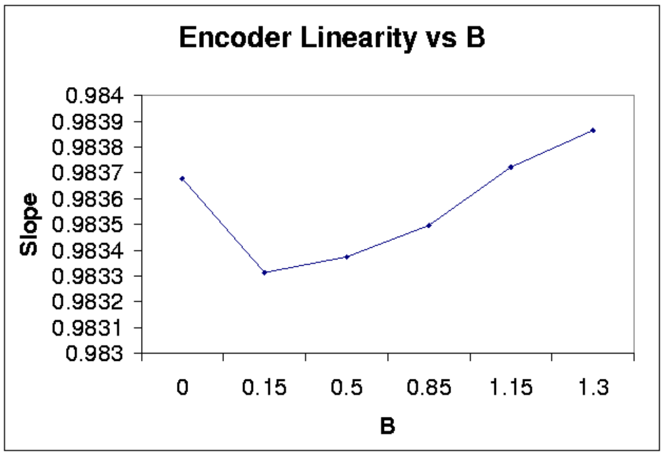

Figure 1: Loadcell Magnetic Field Sensitivity

5 Hall Probe Calibration

- Miguel has figured a way to re-use the existing rotation arm bracket and will have it reworked as required. Since calibration work in IB1 is nearing, Rich will need to secure Ryuji's laptop for use there.
- Miguel will have Greg move the Lab A apparatus to IB1 as soon as the rotating table is remounted.

6 Field Calculations

7 NMR R & D

8 Schedule

9 Installation

- Rich measured the performance of the custom loadcell he bought from Futek in the IB1 magnet. He loaded the cell with a (stainless) bolt and measured its output first when it was outside the field, then immersed in a magnetic field with the load cell parallel, then perpendicular, to the field. He increased the load and repeated the measurement. The process was repeated for fields ≈ 0.4, ≈ 1.0, and ≈ 1.5 T. He plotted the loadcell output in the field vs its output outside the field for each load and field level. The data follow a single straight line indicating no great dependence on field:

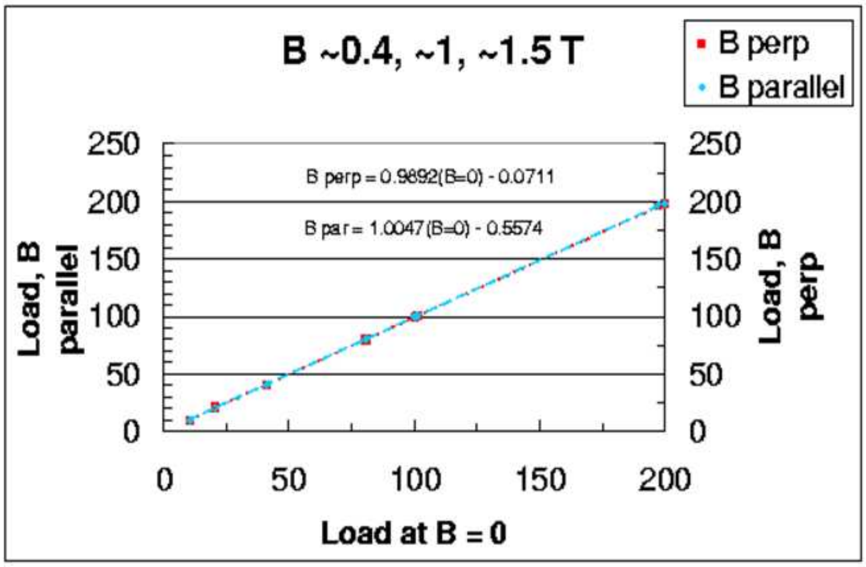

Figure 2: Loadcell Magnetic Field Sensitivity

Rich noted the plot is not the best way to present the data, but he believes the data shows the load cell is insensitive to field at least to the level of a few percent, so no further data or analysis is needed to justify use of the devices in the detector.

10 New Collaborators

- Rich met with Kurt and obtained information of use to NIKHEF. His note to Frank is appended:

  Reply-to: rpsmith@fnal.gov
  To: flinde@mail.cern.ch
  cc: hefisk@fnal, krempetz@fnal
  Subject: Your Recent (7/17!) Note
  Date: Tue, 04 Aug 1998 12:46:14 CDT
  From: Rich Smith <rpsmith>

  Hi Frank,

  Finally our magnet is nearly reconnected, and I have talked to Kurt about your note.

  Regarding the clearance between the fiber tracker and the magnet cryostat, we find:

  1. Our drawings show the "stay clear" outer radius (OR) of the fiber tracker is to be 525 mm (dictated by the connectors at the ends of the outer layer).

  2. The magnet cryostat inner radius (IR) "stay clear" was to be 532.8 mm and Toshiba achieved our specification everywhere except right at the south bulkhead (at the 11-oclock diameter) where the diameter is 0.9 mm too small. and potentially at two small regions in the bore of the magnet, again 1 mm or less too small on the diameter. It is therefore reasonable to claim the magnet IR is everywhere greater than 532.3 mm.

  3. If the tracker is built as expected, then the radial gap for the hall probes is about 532.3 - 525 = 7.3 mm.

  4. Kurt suggests a small "clip track" be bonded to the magnet vessel with cross section:

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/              \        ^ 2.3 -- 3 mm
\ ____________/         v

|<------------->|
      25--30 mm
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  It would extend the full length of the magnet, be made of thin aluminum sheet metal (e.g. 0.8 mm thick), have radial extent perhaps 3 mm, and be 25 – 30 mm wide. The open side of the "clip track" faces the inside of the magnet bore, and the hall probes are mounted on a thin strip of material that slides along the "clip track", so the cross-section is:

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      X |    | X
   /----|---|---\
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5. With the clip track 0.8 mm thick, and the hall probe mounting strip 0.5 mm thick, the hall cube then must be less than 7.3 - 1.3 = 6 mm thick radially.

Thus your plan for a 4mm thick cube is conservative. Do you think a 0.5 mm thick strip is stiff enough to slide 1.3 m into Kurt's clip track? Your stainless is OK if it is 304 or 316 (i.e. totally nonmagnetic).

Evidently the cables for the probes could be mounted where the "X" are in the above diagram.

6. Note there are four polar positions where we will have no access for the clip tracks – at the horizontal, and at perhaps 45 degrees below horizontal. These are where the insertion fixtures and final mountings for the tracker will be attached to the magnet vessel end flanges.

We must decide at what polar angles we should place the probes, and at what spacing in Z.

Regards,

Rich