From: George Lolos <George.Lolos@uregina.ca>
Subject: **Report on our meeting at UofA**
Date: May 2, 2008 2:13:23 PM GMT-06:00
To: Tim Whitlatch <whitey@jlab.org>
Cc: Jan Soukup <jsou@phys.ualberta.ca>, glachat@phys.ualberta.ca, Elke-Caroline Aschenauer <elke@jlab.org>, "zisis@uregina.ca" <zisis@uregina.ca>, James Pinfold <pinfold@phys.ualberta.ca>, "elton@jlab.org" <elton@jlab.org>

Hi Tim:

Gilbert, Jan, Jim, Zisis and I had a series of meetings and we did a visual inspection of the production spaces. We discussed many aspects and this e-mail is to summarize the content of the discussions, give us a chance to correct and/or add and to start the consultation and collaboration to lead to the final BCAL production.

First, let me provide answers to your six points:

>>> 1. Are tolerances given on drawings achievable?

Going over the designs of the Al base plate you had sent some time ago, Gilbert's feedback is that the tolerances quoted can be met.

>>> 2. Will additional tooling holes be required?

As you know, each module is supported for handling and transportation with the addition of a steel channel beam. The mounting holes indicated in your diagram can be incorporated to attach the beam to the Al plate. However, in order to provide added strength and stability to the plate against side movements, some additional threaded holes are needed "off-axis" to the center line where the present mounting holes are indicated.

>>> 3. Would it be better to machine the outside face features of the aluminum (1.25 inch thick) before layup?

No. The matrix is built upon a straight edged plate of Al as delivered by the supplier. The same for the top Al plate. Then, the module is machined at the required 7.5 degree angle as one unit.

>>> 4. How much extra material on the aluminum plates is required before machining?

Gilbert's experience from the last batch of Al plates we received for module construction was such that the plates were very uniform in thickness and needed no machining to improve uniformity. Therefore, if the plates we receive have the same standard of uniformity no additional material is required to be removed by machining. The plates need to be roughened on the side of the matrix build-up to increase epoxy adhesion but that's all.

>>> 5. How will they handle the wedges before and after machining?

The matrix is handled by steel rods inserted through-and-through the steel support beam providing a place for craning straps to the attached. The steel beam also supports the matrix during machining, in addition to supporting jigs on the top surface and the sides of the matrix. The steel beam will need to be removed before the modules are mounted on the BCAL mounting frame so attention needs to be paid to the handling at that stage.

>>> 6. Will the inner aluminum plate need to be machined after layup?

Yes, as stated in item 3 above.

On the issue of tolerances before and after machining, we discussed a number of ideas. For the prototype modules we had the luxury of loose alignment because we only cared that the matrix was built straight with respect to the center line - and even then some misalignment was inconsequential. However, for the BCAL modules, we must assure that the matrix is built symmetric with respect to the center line and when machined to remain within tight tolerances for length with respect to the mounting holes. This means that both the construction phase of the matrix and the machining phase for the two ends must be tightly controlled. Feducian marks will be needed on the Al plate to mark the ends (after machining) of the module.

For the first phase, of building up the matrix, a groove of 1.0 mm width and 0.5 mm depth will be machined along the center line

and we will glue a fiber or wire of 1.0 mm diameter. The base (grooved) Pb sheet will be laid to follow that fiber/wire along it's middle when it's glued to the base Al plate. We followed such a procedure for Modules 1 and 2 to prevent the lead sheet from sliding on the epoxy layer under piston pressure before it cures. It worked nicely. For further assurance of alignment of the critical base Pb sheet, and the subsequent layers of the same width, it is perhaps advisable to have holes drilled along the length on either side of the lead sheet for teflon or high density polyethylene pegs to be inserted to make sure the bottom layers in the step-pyramid are laid up straight. Epoxy does not adhere to teflon so they can be removed before piston pressure is applied and reused. Subsequent layers of the step pyramid can be guided by alignment jigs made out of the same plastic material. We used a version of such a system before but now we have to refine it to allow us to built the whole height of the matrix symmetric and square.

For the machining of the two ends, Gilbert has proposed to insert a center peg in the Al plate as a reference point and make up a jig to mount the module and center it and - when one end is machined and polished - rotate the module 180 degrees and machine the other end. This will allow a precision of fraction of a mm for overall length from module to module.
I propose that we have one test Al plate set up - as required for the final construction - and prove the alignment and precision issues and correct as necessary well before actual construction. If this can be done by September, we also discussed the value of you Tim going to Alberta when Zisis and I are also there, to review all technical aspects of machining and other engineering issues while on site and with face to face interactions with Gilbert, Jan and all the other guys involved. This will allow us sufficient time to make changes or improvements and be ready to implement as soon as funds are released for construction.

I think this is a good start.
Cheers,

George