Subject: **Cooling Meeting Minutes - 27 November 2001**
Date: Wed, 28 Nov 2001 12:45:19 -0800
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Hi Y'all,

Agenda reprinted below:

1. Status of tubes for EB (Jon W. and Tom J.)

2. Info on progress with the indium fittings design (Fred, who is very busy, so I expect this will only be cursory)

3. Demating testing of irradiated, flourocarboned luer locks (Tom W. and Fred)

4. Update on last phone meeting with CERN (all who were there for all who weren't)

5. Plans for testing capillary tubing (Neal, with samples)

6. Most recent material testing results (Neal)

7. Future plans (all)

And here's the minutes (here're the minutes? here's the minute? you decide):

1. Two bent tubes are ready on tuesday, third needs to be pressurized and cleaned out before wednesday (no problems seen here). I have received 6 sleeves to weld to the 3 bent tubes (from Fred). We will try to weld capillary tubing as well when I visit EB on friday, but this will only be to a piece of 6061, not to any sort of fitting.

2. Fred has prepared a very nice design for both indium and luer lock fittings with much lower mass. The luer lock cross sectional area is 41 mm^2 for the new design, whereas the current one is 115. For comparison, the variseal cross section is 35-40. For the indium fitting, Fred's design is 36 mm^2 in cross section, which is still quite a bit larger than the stave design (although this is CuNi) which is about 20. Fred is going to reduce his design down to below 30 mm^2, which I think makes it very competitive, as we have been generally thinking that the aluminum version of the indium stave fittings will have to have a slightly larger section (though Marco is making Aluminum indium fittings right now that are the exact same cross section as the CuNi ones). Fred will finish drawings for our two new designs and issue an order for outside fabrication before the beginning of christmas break (break? I guess I still think I'm in school or something).

3. The irradiated luer locks (in C3F8 - 50 MRad) have been tested and disassembled. One sample of three failed the first VAC check, through an obvious leak in the glue joint (yet more reason to laserweld). This was not tested further. One of the remaining two samples passed the VAC, pressure, 0 C, -35 C, and VAC checks in the ten scale!, while the other just passed in the mid six scale (though still within spec). The three samples all

disassembled without any binding, under torques of 0.25 to 0.6 Nm. For comparison, the stave indium fitting requires 1 Nm to assemble. Fred has indicated that there was obvious vacuum grease on both mating surfaces of each fitting, meaning that no C3F8 intrusion was seen, or that C3F8 liquid has no effect on vacuum grease! This was a very conservative test, so I think we're looing good. We may want to retry this without any vacuum grease to begin with, to see how bad the binding could be, but right now, I see no reason not to use vacuum grease as part of the final production fitting assembly procedure.

4. Update on CERN phone meeting - see last minutes that I sent out. Also they're posted on my website.

5. Capillary tubing has been given to Tom W. for initial testing. I will send out a sequence of bend/pressure and leak tests that we need to conduct on the tubing, and I am also sending some out to be composition tested. I will also see what maximum lengths we can get from the vendor (same as other tubing). The capillary is perfect size, 1.5 mm OD, 1 mm ID, and appears to be very robust. Tom W. is looking to see whether we have 1/16" swage locks for the tubing for testing, and if we don't, he will order some. I will have some tubing welded to 6061 at EB, so that we can assess its weldability, though we will need to do a better test of this in the near future.

6. The 4mm tubes we have tested to be 3003, while the 8mm tubes tested to be 1060. It seems there is little consistency in the material from K&S. Since it now appears we can weld 3003, this is not such as issue, but we need to weld more 3003 samples just to be sure. This will be done by EB in the near future. It also has implications for our backup vendor, Applied Fusion, since they were unable to weld the 3003 tubing at all (just like Directed Light). I will explain the way EB does it and see if they can follow, but apparently the guys at EB are just very good at what they do.

7. Future plans are kind of interleaved in the above. Major actions are:
   1. Fred's new indium design and luer design drawn up and shopped out
   2. Capillary tubing tested and swage locks found or ordered
   3. Bent tubes welded and some other tests done at EB
   4. Capillaries sent out for material analysis

A couple of issues for EB discussion (me) - repair of welds that leak, and handling of sectors (including full sectors that may need repair). Also, alignment, jigging, etc.

Another note. Since we are concerned about the torque carrying capacity of the laser welds, we plan to cement the area behind the weld with loctite (after leak testing first). However, in order to determine what effect this has, we will torque test fittings that are welded and loctited, and then test some samples which are loctited only. This will give us a relative measure of the torque capacity.

If I have forgotten anything, please let me know. Thanks alot for all of the great work. I was very pleased with results of the meeting, as we seem to really be converging towards a solution in the near future!

Neal