

**Instrumentation Workshop Dec. 4-5 @ Physical Sciences Laboratory
DOM production working group**

Participants

Lars Thollander	Stockholm University
Dan Wahl	PSL (Dec 4)
Reiner Heller	DESY-Zeuthen
Rolf Nahnauer	DESY-Zeuthen
Klas Hultqvist	Stockholm University
Allan Hallgren	Uppsala University
Johann Lundberg	Uppsala University
Jim Hoffman	PSL
Glen Gregerson	PSL
Bai Xinhua	Bartol, U of Delaware
Kurt Gunther	Bit7, UW-Madison
George Anderson	UW-Madison
Kael Hanson	UW-Madison
Mark Krasberg	UW-Madison (providing the notes)
Chris Wendt	UW-Madison (Dec 4)
Matthias Bartelt	Wuppertal University
Dave Seckel	Bartol
David Lee	UW-Madison (SSEC) (Dec 4)
Brian Pechan	PSL
Howard Mattison	PSL
Jim Bacchus	PSL
Albrecht Karle	UW-Madison (Dec 5)
Jeff Cherwinka	UW-Madison
Xu Zhai	UW-Madison (Dec 4)
Nobuyoshi Kitamura	UW-Madison (Dec 4)

Thanks to Nancy Dopkins for taking a bunch of the pictures and to Farshid Feyzi for the use of his digital camera and for posting the pictures on the web.

Some time after the start of the meeting I was designated to take minutes. Apart from a 45-minute period on day 2 where I left the room for an alternate meeting, and consequently missed a presentation by Chris Wendt almost in its entirety, here are the minutes. There were occasional breaks which sometimes included visits to the DOM production room.

I apologize, in advance, for often not knowing the names of the people who were talking, and sometimes for not understanding what they were talking about, and for misinterpreting statements etc.



Figure 1 'round-table' discussion room

Automatic Temperature-Control of Freezer

The minutes pick up during a discussion, put forward by Dan Wahl, that the freezer temperature should be computer-controlled. The minute-taker completely agreed with this sentiment. After all, this is the only part of the entire DOM-testing procedure which currently requires manual control. Kurt Gunther thought it was a fine idea but that it was necessary to be careful about having a completely automated system in case something broke, especially the first time around. Jim Hoffman explained that the current PSL freezer controller was manual. Dan Wahl said something like "if we can build a neutrino telescope in the South Pole then we can damn well have a computer-controlled freezer". The upshot of this was that after the meeting was over, Kael Hanson said that if I wanted a computer-controlled freezer then I should be the one to look into it. I did not get the impression that the European freezers would ever be computer-controlled.

Marathon Production Runs

There was some talk about the pros and cons of having marathon production runs. Jim Hoffman explained that marathon production runs were better because that way you don't have to worry so much about coordinating work with other projects, and constantly pulling people off of other projects to do your project etc.



Figure 2 DOM production room

Freezer Temperatures

Kael Hanson presented charts which showed the proposed 1-month testing cycle as a function of temperature vs time. Some testing would be done at room temperature, some at -20 centigrade, some at -45 centigrade, and some at -55 centigrade.

Alan Hallgren explained that the European freezers only go down to -40 Centigrade. Rolf Nahnauer said his freezer goes down to -45 Centigrade, although they have a problem maintaining -20 Centigrade. He stated the freezers are all different (the freezer at PSL will go down to -55 Centigrade)! Dan Wahl suggested having error bars (tolerances) for the proposed freezer temperature settings.

Meanwhile, the freezers take different lengths of time to reach -45 Centigrade. Rolf's freezer does it in 3 hours, Allan's in 24 hours, and PSL's in 36 hours.

Jim Bacchus inquired as to whether or not the -20 Centigrade testing should be done during DV (Design Verification).

Chris Wendt proposed to minimize the testing at -20 Centigrade - "a quick check".

Bai Xinhua (interested in IceTop) asked for extra testing cycles at -55 Centigrade, and Kael Hanson said the IceTop Modules will need to be located at PSL for such tests (because the PSL freezer is the only one that can get to minus 55).



Figure 3 PMT Collar Jigs

Freezer Air Circulation

Jim Hoffman suggested we needed air circulation in the freezer to prevent hot and cold spots. This is especially true during testing since each DOM will have its own insulating material (for example, a can or a cloth over it).

Cold Soak Motivation

Dan Wahl was interested in the motivation for having a long cold soak. Kael said there were two reasons: to ensure components will not fail at cold temperatures, and primarily to understand the gel-degradation. Dan Wahl said we should adopt Kael's testing plan as a baseline and modify it as we go. Allan Hallgren thought that a 4-week test is not optimal for gel studies and that a 3-month test should be performed. He pointed out that a 4-week test will have to be defended in a review. Kael said that Elisa was able to see gel degradation after just two weeks. Alan Hallgren pointed out that the total time a DOM will spend at -40 centigrade in the testing plan is only a little more than two weeks. Kael mentioned that infant mortality studies will be done during design verification. Kael talked about the gain droop of some of the AMANDA modules. Jim Bacchus pointed out that the earlier AMANDA problems may not exist this time. However, he said that we have an incredibly aggressive maximum module loss rate (5%). He suggested we have a burn-in process for every module which is going to be deployed. Kael said that all components have been temperature qualified and that the problems to worry about are solder joints. He said that while some people want more temperature cycles, some system engineers are against this because they fear thermal stressing.



Figure 4 the gel

Test Cycle Discussions

Dan Wahl noticed that 10 hours had been allocated per cycle for flasher tests (in Kael's testing cycle chart). He said "my god, I was not aware of this". Bai asked at what voltage are the tests performed at - he pointed out that one DOM in each tank will run at low gain and therefore some testing needs to be done at low voltage. Kael Hanson replied that there are two set points for ICETOP. ICETOP is a lower risk item and priority should be given to InIce DOMs. He said "the testing plan should be solidified by..." Chris Wendt interrupted "by now!" Kael finished his sentence "by the end of the year". Chris inquired as to why the cold reboot test is performed five times. Kael said "I don't know, it's some number." Kael said that the last three tests on the testing plan are very important because they cannot be done in the ice. They comprise optical sensitivity, linearity, and flasher light output. Rolf Nahnauer suggested that we should go through the different steps and determine where we agree and where we disagree. For example, he claimed that the allocated 15 minutes is not long enough for the dark counts, in his experience. Kael Hanson and Chris Wendt disputed this. Rolf Nahnauer asked if 10 hours for the flasher tests was necessary. Alan Hallgren said that we should continuously monitor noise - for example, there could be a corona somewhere. Chris Wendt asked if there was a plan for a small freezer to troubleshoot problems. Kael Hanson said we need to define what constitutes an anomolous DOM. Bai asked where Kael's testing plan plot was. Kael said it was on DOCUSHARE. Dan Wahl said "Thanks Kael for doing this work so we could all beat you up".



Figure 5 The de-gassing chamber.

Pouring a DOM

After lunch Glen Gregerson poured and assembled a DOM. During this procedure Jim Bacchus suggested putting a temporary protective layer on the PMT to protect it during assembly. Jim Hoffman suggested something like saran wrap, but added there has never been a problem with scratches in the past. There was also some concern regarding safely handling PMTs during this stage where the PMT could potentially be dropped. Eyeglasses and protective clothing were suggested. The safety engineering staff should be consulted on this matter.

Detailed Discussions on Specific Tests

Chris Wendt showed detailed plans for all of the proposed tests. He started with the flasher light output test. There were 2 aspects that had been envisioned at DFL:

- 1) do not look at the light output - look at the current going through the LED. This is essentially an STF test - you assume the LED current can be used to determine the light output.
- 2) EITHER have a large fiber which sees light emitted in the can and carries it to a PMT outside of the DFL OR use a standard curve of optical output vs temperature to decide the way the DOMs behave.

At this point the note-taker went to a different meeting for approximately 45 minutes. Upon his return, Chris Wendt had almost finished making his presentation. It was eventually decided by Kael that the flasher board calibration should not be included in the DFL testing. Rather, the calibration and test jig originally proposed for room temperature testing and characterization of the flasher will be modified to perform the full tests including temperature profiling.

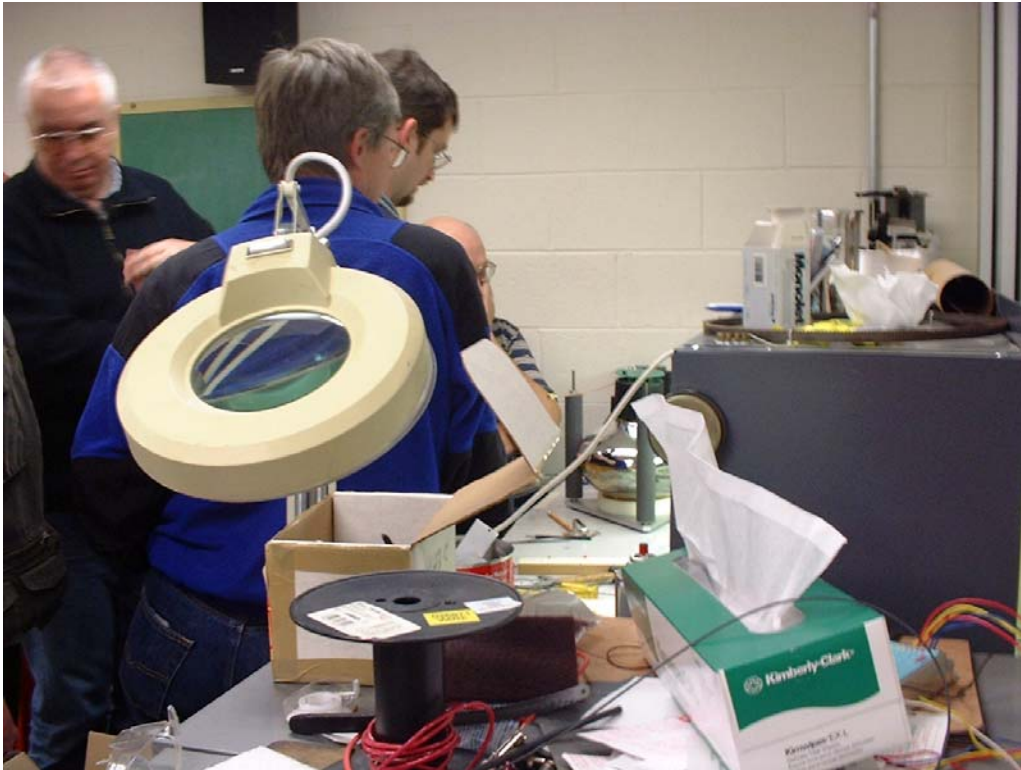


Figure 6 in the E-shop

When I rejoined the discussion Chris was talking about the Nonlinearity Scan Test. He said that we have a laser which can be computer-controlled in conjunction with filters which can be rotated into the optical path to enable us to automatically scan intensities over three orders of magnitude.

Allan Hallgren asked about the definition of pre-pulsing. Chris Wendt and Kael Hanson responded that this was a specification on the PMT given by Hamamatsu.

Light Sources

Rolf Nahnauer asked to talk about light sources. Chris Wendt agreed that this was very important. Rolf envisioned no problems with the optical sensitivity test. He said that we must discuss the light source, and also the operating point (the gain) which is determined in test #3. Chris Wendt said that initially he planned to use the internal LED but that this idea had changed in the software workshop. Rolf said "well, all right then!" Someone said that it would be good to see what the LED was doing at specific current values. Kael Hanson said that as the PMTs age, there will be different set points and the transit

time will change with time. Allan Hallgren said that we can get the transit time versus the voltage. (KH: we have decided to use an external source for the gain characterization because of the poor positioning of the on-board LED. However, the question of how to perform in-ice calibration is still to be resolved.)



Figure 7 potting a PMT

DOM pass/fail criteria

George Anderson asked if the PMT tests were part of factory testing? Chris Wendt replied that the PMTs are linear up to a certain level of intensity and if they aren't then they can be flunked. George said that in the FAT you had pass/fail criteria. He noted that the pass/fail criteria occurred at a temperature of -45 centigrade. Chris Wendt said that not all of the freezers go to -45 degrees. George said that in that case there was no margin - that Albrecht & Company had specified that the factory acceptance test was to occur at -45 degrees. The design is at -45 degrees, and the DOMs will work at -40 degrees, so the DOMs should be tested at -45 degrees. Alan Hallgren said that it is the components which are rated at -45 degrees, that long ago we had agreed that the testing would be done at -40 degrees. George Anderson said that in that case we are operating at zero margin (for the coldest DOMs). Alan Hallgren said that most DOMs will be used at much warmer temperatures than -40 degrees. George said that the risk is that some DOMs will not work. Chris Wendt said that such a discussion is for another group. Chris added that the pass/fail criteria are tests which you would call FAT. There is additional stuff which you could record along the way - a parasitic test - you could call it "PAT".



Figure 8 attaching the mainboard

Triggering

Rolf Nahnauer asked how we are going to start the readout - how are we going to trigger? (he was referring to single photoelectrons from the outside source). Do we have a chance to make a real type of trigger - he said that Alan Hallgren has the answer. Allan said we could supply the DOM mainboard with the electronic signal. Kael agreed that you put a pulse into the reference DOM on an SMB connector. Rolf asked if that was the normal way to do it. Chris Wendt said he liked the idea, and we should do it that way. He said that if we use an external source to measure the transit time then any offset is a constant for all DOMs. This means that cable lengths would no longer be an issue. Rolf was in agreement to try to make such a trigger. Chris Wendt said we will make both - a PMT input and also an external optical input.

Can Rev2 mainboards be used now?

Allan Hallgren asked how bad the rev 2 board was - can it be used? Kael Hanson didn't think, mainly because of software compilation problems, that the rev 2 board would be useful for him. Allan Hallgren said "I have heard enough already". Chris Went pointed out that we only need one rev 3 mainboard per lab. Kael said we need a slight redesign (some basic components, matching impedances etc). Allan said it all sounded feasible. Rolf said that the timescale can be fixed when we get the necessary materials. Chris Wendt suggested giving the Europeans rev2 mainboards so that they can at least set everything up. Kael said that some allocation of rev3 mainboards would take place.



Figure 9 mainboard attached!

Known PMTs

Chris Went pointed out that an optical device would be needed to make a common reference for the optical sensitivity test. Alan Hallgren replied that there was a standard Hamamatsu - this was a 10-inch PMT and the noise rate was 10k. Kael Hanson said that Hamamatsu makes PMTs with background counts of 10's per minute. Alan Hallgren said that in our case the signals will be much stronger. Chris Wendt asked if we will be counting single hits? Alan said that this was not necessary. Chris Wendt said we could since we will be counting SPEs in the other tests. Alan said that he agreed. Chris Wendt proposed that we always have the electronic signal, and we have the ability to turn on the optical signal with a time delay. Alan and Rolf agreed.

Light Sources

Rolf Nahnauer said that the main problem is to determine what to use as a light source. Rolf has identified sub ns pulse laser which emits 337nm (UV) and has an optical module with dyes for other wavelengths. Rolf did not know whether it could be tuned to any wavelength.

Alan Hallgren said a nitrogen laser has excellent time resolution. Kael Hanson said that it costs 25k Euro, and there are cheaper ones with 5ns resolution for a few thousand dollars. Alan Hallgren suggested buying a PicoQuant and then a laser. Rolf Nahnauer said that the PicoQuant has pluses and minuses, but it can externally trigger and the light pulses can be any configuration you desire. The rep rate is 40MHz, but it is unstable at low intensities (Chris Wendt said that attenuators could be used instead for \$1k each). Rolf finished by saying that the time resolution of the PicoQuant is excellent (700 ps).



Figure 10 attaching the mu-metal grid

Another possibility was to have a xenon lamp and a monochromator for a few thousand dollars. Rolf said it costs \$10k Euro. Kael said it costs \$700. Rolf said that with all the accessories it comes to \$10k. Kael said that he can put together the same system for \$2k, except it would have a manual crank - it would not be programmable.

Kael asked what the application of the fast nitrogen laser was? Rolf replied that the dye-laser is tunable between 225 and 400nm. Kael asked that if the rep rate was only 50 Hz then it doesn't work for the SPE tests. Rolf and Alan both said that there is a trigger - you just have to wait a while! Alan Hallgren said that if it is controllable then it will solve our problems. He has not bought a

PicoQuant yet. Rolf Nahnauer thought the same procedure should be done in every lab. He would get more detailed specs on the device since the company is right around the corner from him in Berlin. Rolf suggested we all look into the different possibilities before Christmas. They are PicoQuant, xenon flash lamp and monochromator, uv laser, and the nitrogen laser and dye system. The latter only has a time resolution of 4ns. Chris Went said we need 1ns time resolution. Kael said our time resolution goal is 5ns. Alan said "so 5ns is OK". Kael thought yes.

Rolf said that he voted for the PicoQuant (he already has one). Chris Wendt said that he agreed. Alan Hallgren said that he wasn't going to say anything.

Chris Wendt mentioned the optical sensitivity. We would be counting scalars in the DOMs with the sources either on or off, not reading out events. Were people happy with subtracting the background this way? Rolf and Alan said no, that if we used a laser we would have a trigger.



Figure 11 mu-metal grid attached!

Freezer Design

Rolf Nahnauer asked about the freezer design. Rolf and Reiner Heller have a design with three floors, the UW design has 2 floors. In their design the light sources is input to a bundle of fibers (24 fibers per bundle) and a lens is used to distribute the light to each fiber in the bundle. Chris Wendt said that our bundles are tightly packed. Rolf said that with a laser source this is not an issue but that we need a common solution. Chris Wendt said that most of the cost is in the fibers themselves. Rolf said he would send their drawings to UW. Chris Wendt said he agreed and that we would see if we could match it. Rolf said that

he was hoping for a common viewpoint. Kael Hanson said that the electrical wiring for the freezer is important and that UW should design this and supply the Europeans with the design. Chris Wendt said that there will be 4 DOMs per junction box - we can all agree on something simple.

Alan had a cable question, to which Kael replied that we would need > 250 meters of cable for RAPCAL to work. There are two solutions possible here:

1. Use actual 250 m lengths of cable - potentially bulky
2. Use a cable filter - Nobuyoshi Kitamura is working on this.

We will probably initially resort to lengths of real cable in the short term while there are not that many DOMs.



Figure 12 a close inspection

Light Sources Revisited

Chris Wendt said there was an open question on how to spread the light source - diffuser vs a lens? Alan said he had a third choice. Rolf said that we should try it out before we build an entire setup. He said they have two cans and they will find out what they have to do.

Chris Wendt had one concern. If we make use of the light bouncing around in the can then the pulse will be spread out which means the time resolution will be spread out. Kael said it will take two weeks to do this measurement. Alan said the time resolution will be about 5ns. Chris Wendt said that we want to make sure a given DOM has no tail on the resolution. He thinks it won't take 2ns if

you have a highly reflective surface. Rolf Nahnauer said that we have to compromise on some of this stuff. Rolf suggested that we take a small known photomultiplier, and use a light guide to go to the can, and put the PMT in different positions if you want to understand distribution patterns in the can.



Figure 13 the Hardigg boxes

12/05/03

Allocation of Hardware

Albrecht Karle showed several tables which specify which institution gets which piece of hardware when, and also when the hardware gets shipped to the South Pole. For the DOR cards there are two defined versions (0 and 1). For the mainboards there are three versions to worry about (3, 4 and 5).

There are 16 total rev 3 mainboards, of which 8 are allocated for PSL. In Albrecht's table, 17 mainboards have been allocated to the different institutions. Therefore "we need to negotiate", since the mainboards have been oversubscribed.

Any mainboard leaving LBNL will be quickly converted to a DOM. Rolf Nahnauer agreed to reduce his short-term need for a rev3 mainboard (he'll get 2 of them in January). Albrecht thanked him and then asked who was using rev2 boards and who could do useful stuff with them? Kael Hanson stated that Chuck (McParland) might be able to run useful measurements with rev2 mainboards. Dave Seckel suggested asking Chuck this question. Albrecht asked Alan Hallgren if he wanted any rev2 boards. Belgium (Daniel) has already signed up to receive one or two rev2 boards. Alan said that for them a rev2 DOM would be a mechanical object only. Rolf Nahnauer pointed out that the institution which can best handle

software switches (for the different mainboard revisions) is LBLN. Albrecht added that the same is probably true for Karl-Heinz Sulanke (Kalle). Alan said that when they need a mainboard depends on when they get a DOR card. Rolf said that at the end of January he will have two "free" DOR cards - Albrecht said "hang on, we are not done yet". Alan said "you are playing your cards too early Rolf!". Albrecht asked if Doug Cowen wants a rev2 or a rev3 board at PSU and if so how soon? Dave Seckel said that the PSU DOM would have to support TestDAQ so it would have to be a rev3 board. There was some talk about using our domhub to allow other institutions to log in remotely, and while UW does do this on a limited basis, it is actually pretty hard to set this up, and Kael Hanson pointed this out. Albrecht asked Kael if the LBLN rev3 board allocation could be reduced. Kael suggested Albrecht ask Chuck. Albrecht said he was hoping that Kael could speak for Chuck. Kael said that Dan Wahl needs a rev3 board for flasher board development. Kael wants a rev3 board for software development. Albrecht said that the rev3 boards have been oversubscribed for January by two boards and that he would talk to LBLN about it. Albrecht pointed out that it is hard to get boards out of LBL. Chuck McParland had told him that the boards were in such high demand at LBL that if you leave one on your desk it is likely to get stolen by someone else.

Albrecht said that the first rev4 boards will arrive at the end of January. Albrecht asked why 24 boards are needed at UW by the end of March. Kael replied that they were needed for DV and for acceptance tests, and then they get fanned out to other institutions. Albrecht asked if PSL and Bartol can get one early. Kael said that we need at least 20 boards here. Kael said that we plan for 16 DOMs in our test here - that is fixed - we cannot go less than that. Albrecht thought that Kalle might need more boards for communications development. Kael said that UW doesn't need 24 DOMs after month 5 or 6, that once we get the test right we only need the DOMs for a couple of days. Albrecht said that LBLN should be able to give up some of their 16 boards. Kael said that by month 6 UW can trim its DOM requirement to 12. Dave Seckel said they want 4 boards by June 1 (to go into tanks at Delaware). Albrecht said he needed to check with Kalle if the 6 for DESY are really all needed.

Module Production

Albrecht said that the design review is in May (month 5) and that the schedule is driven by mainboard delivery, as always. We need to ship 280 DOMs on September 15 (4 strings). About 100 DOMs will remain in the northern hemisphere for long-term testing. How many modules can everyone build? Albrecht showed a proposed institutional module-building chart.

Rolf Nahnauer thought that the assigned 20 module production for DESY Zeuthen made no sense - this would be a test production and they should make 20 modules per month for three months (July-August-September). Rolf said that making 20 modules per month is no problem - the problem is testing them. We need time before July for this.

Albrecht said that they would want to test the first production run to verify there was no flaw in the production. Rolf replied that if the components were correct then how could he go wrong? Rolf pointed out that he would have to be ready with the final modules by August 15 so he could do the 4-weeks of testing. He said he needed 30 mainboards by the end of July.

Kael said that we will need to pre-produce and store the modules. Dave Seckel said that at a minimum Rolf needs 10 modules by week 6 (did he really say month 6?). Albrecht said that we need to look at the underlying schedule, but that we

would have some capacity as a collaboration to react to production problems, for example, if a compressor fails at the wrong time. Rolf said that he had two compressors and that if one failed he would use the spare.

DOR card allocation

There will be 30 DOR cards by the end of the year. Kael said we need a DOR card to run TestDAQ. Albrecht said that 42 cards need to be shipped between September and November. We need to assume one DOR card will be able to talk to eight modules by then. Kael said that the current problem (one DOR card can only talk to four modules) is purely a software problem. Rolf Nahnauer asked Albrecht if he was assuming that the DOR cards would be produced by DESY. Albrecht replied that yes, it was a firm commitment. Kalle has promised 60 DOR cards by April, Albrecht is planning on 60 by May. A reference was made to 90 DOR cards which confused the author. Rolf Nahnauer said that if Christian agrees with it then the plan is fine. Albrecht said that a lot depends on the fact that these cards will appear, otherwise everything could be derailed.

Rolf Nahnauer asked why (from Albrecht's table) LBLN needs 42 DOR cards in July? There was some discussion as to why this would be, with no good answer, so Albrecht cut the total from 42 to 32 for now. Albrecht said there should be no shortage of cards, once they appear.

DOMHUBs

Dave Seckel asked if the DOR cards arrive in hubs? Albrecht replied no. Kael said that Berkeley was taking over integration of DOMs and DOMHUBs, where they deliver fully packed units to UW, DESY, and to Sweden. Albrecht said that Chuck needs to be involved in this. Rolf said that he has no hub at all - he had been promised one by Jim - when? There was some discussion about using a DOR card on a non-approved or non-supported machine. Albrecht concluded that if you know how to plug a DOR card into your desktop then good but that if you have a problem don't call Chuck about it. The "pirate hub" at UW Physics is not really a hub - it is being supported by UW, and a bit by Chuck. There was some discussion as to whether this computer should be classed as a hub, and in the end it was. Albrecht said there will likely be many "intermediate" hubs.

DOMHUB power consumption

Kael said that the problems with the existing DOMHUB are the power consumption and the non-standard PCI passive backplane. There is no really good candidate yet. The current domhubs use too much power (400 watts). Albrecht said that there is no real hub design.

Dave Seckel wants Chuck to tell us whether or not the rev4 mainboards will work with rev0 DOR cards.

Jigs

Kael Hanson asked for comments on the jigs? Rolf Nahnauer and Alan Hallgren said that they didn't have a full set of jigs - one each. This was not urgent but in the spring they would need more of them. PSL will ship 6 more jig sets: 3 to Sweden and 3 to DESY to make the requisite 4 at each location. Previously the agreement was for four jigs in each place - and one washstation. Lars cannot get washstations in Sweden. Rolf bought their's in Germany.

PMT HV base attachment

Lars said the conformal coating will not be there. Albrecht said that the HV board will be delivered without the coating. The intention is to do a coating after mounting it to the PMT. Some felt that the coating is not much value anyway. Albrecht is leaning towards some other form of liquid. Kael asked if there was a pending action item on it? Albrecht said he would clarify with George Anderson. He said Dan Wahl would also know. Kael said that he would prefer not to coat the boards.

Documents

Rolf Nahnauer said that document 9016-->9022 must be finished or handed out to everyone in a state of revision. He said that the state of the documents was poor - this was true for gel preparation, true for coating etc. It can be changed but the procedural document must exist in the first place. Kael said that documents like the traveler are listed, but that we need production assembly documents. Albrecht said that there was serious effort being made to get the documents out, but for the HARTILL review he would want more design documentation. Rolf Nahnauer said that production documents are much more important - there are components he had never previously heard of. Jim Bacchus asked if there were system engineering documents? Albrecht replied "not necessarily". Rolf said a lot of work has to be done to clean them up and then to make them available. Kael said that the purpose of DOCUSHARE is that it is a drop box for documentation. Dave Seckel asked about the existence of a project librarian? Albrecht proposed making discussion folders for design ideas. Dave Seckel said that Rolf wanted a complete set of finished documents. Jim Hoffman said that these documents do not exist at the moment.

Gel Pouring

Alan Hallgren advocated for the existence of a plan. Jim Hoffman said that all options are still on the table. Alan said that a preliminary decision was taken in Mons (on pouring the gel) but people here wanted to check it out. Albrecht said that a lot of investigation was done on how to pour gel, a recommendation was made, and we have a preferred solution. Rolf said that that is exactly what he suggested - a gel pouring document, which would state what the open points were and what steps should be taken to solve the problem. Rolf Nahnauer pointed out that in Europe he cannot purchase the gel. Jim Hoffman offered him two bottles to take home on the plane. This seemed like a reasonable idea until it turned out that the bottles of gel are unmarked, and that shippers in the USA refuse to ship the stuff within the USA (it has to be some type of special shipment). In the end it was decided to ship the gel to Rolf in Europe, which would avoid any incarceration on his part after he tried to transport potentially hazardous chemicals onto a 747. Jim Hoffman stated that there has been progress on the gel pouring procedure. Rolf said that the plan had a very large number of missing pieces - lots of question marks beside "expected delivery".

Albrecht said that the DOMs could be tested without the harnesses. Rolf said that in their freezer design (with three floors of DOMs) the harnesses are used to help support the DOMs. Doing this has the advantage of giving each DOM a well-defined position. Additionally, Rolf will decide on which calibration PMT to use.

I think Rolf said that it is not possible for him to purchase the glue in Europe. Jim Hoffman promised to contact GE to see if the glue can be sent via

airplane (as well as the Dow Corning gel). Albrecht said that the best way to do it is to contact Terry Hannaford, tell him "get this to Europe, it's your problem". Rolf pointed out that the Dow Corning gel has a delivery time of 6 weeks (in Europe) and he expects it in three.

Kael mentioned that after the gel is poured and the PMT is inserted, on the recommendation of Elisa we were going to degas again. Jim Hoffman said that we will handle that separately from the gel degassing. This also has to be tested. Kael said that this was the default. Albrecht inquired about the document and who should write it and said that Jim Haugen was the natural person to do it. Rolf said that such a document might already exist on Jim Haugen's notebook - Rolf in the past had asked for all of these procedural documents from him and had received a couple of them to date - there was speculation that the others did not yet exist.

Mu-metal grid

George Anderson: the mu-metal grid should be grounded

Kael Hanson: rev 4 actually requires grounding

Pressure Sealing

Kael pointed out that this was a near disaster the first time we encountered it. Jim Bacchus said that the penetrators are arriving mid-January at a rate of 10 per week. Alan Hallgren added that the pressure during sealing (the low pressure) is to be determined.

Database

Keal Hanson stated that there is a working useful testing database. STF tests work - results of higher order testing are currently a problem. rev0 of the schema has been proposed. It should be opened up for discussion. It hasn't been implemented yet - it is in the design phase. The database - because of changing mainboards - is hard to organize eg WIPs database contains snapshots, not the whole picture. Jim Hoffman added that we have had a binder up until now. Albrecht asked who the #1 contact was for the database? Haugen? Rolf said that the database must be set up from a software point of view. Alan stated that we would like to be able to use the database. Kael stated that the database is an SQL postgres database Rolf noted that the DOM production database, meanwhile, is XQL. Albrecht asked "who does it?" Kael said it was Cindy Mackenzie. Dave Glowacki provides routines for getting info out of it. Rolf asked why the MySQL database hasn't been implemented yet? Weren't people aware of the decision? Albrecht said that John Cavin should make it clear whether or not SQL is going to be used anywhere. We need to bring this to his attention. Kael suggested that Rolf take this up with John Cavin or else with the database people in Belgium. Albrecht said that it is John Cavin's job to clarify this. Rolf pointed out that it was actually stated in the minutes of the working group. Albrecht said "do you read all minutes from every working group?" (this has caused me to question the usefulness of this really long minutes document!). Rolf agreed to bring this item to John Cavin's attention, since the database development does not appear to be coherent.

DFL Cabling - design concerns

Alan stated that there are practicality issues - for example, patch panel problems. Four modules are attached to each patch panel. It is not practical to mount the patch panel on the wall. Albrecht stated that he was the source of this proposal and he showed a drawing where a distribution box was located at the center a group of 4 modules. Alan said that it was not practical for side mounting. Alan says it is easier if the cable hangs from the ceiling, or from the shelves and then you can connect the cables up right in front of you. Kael said that the distribution box (which houses the shaping circuitry) would have a receptacle where you would attach the cables. Albrecht stated that the box is to aid in local coincidence testing. There would be 80 cm and 17 meter cables for long and short cables from DOMs to the distribution box. All DOMs have a local coincidence capability which can be tested. Alan thought the cables should plug directly into the DOR cards. Albrecht explained that we have to get experience with patch panels since they will be at the South Pole. Alan said that there was a choice. Albrecht said that the problem is that the cables are too short. As long as we don't need to use more than 20 or 30 DOMs at once then we just need a few 300 meter pieces of cable for now.

Grounding

Alan wanted details on grounding etc. Albrecht said that he wasn't sure but if you asked him he would ground everything. "Ground, EMI, and safety, these are the three words you can use to disrupt a meeting". Albrecht is reluctant to extend the Baumkugel shield passed the penetrator. It is OK if the DOM has its own ground. Johan Lundberg asked if the shield should be connected to the station ground - rack in the counting house. Lars Thollander said that the ground should be floating. A 10kOhm resistor to ground would pick up noise. Johan said that George had suggested connecting the counting room copper sheets to the station ground. Lars added "as long as we don't connect it to the cable shield". He said there can be a problem with ground currents. There could be a potential between different ground connections in the counting house.

Tests of incoming units as they arrive

Kael said that we need to know that each PMT is good. He said that we also need to test the mu-metal cages - everyone agrees on DESY's scheme for doing this. There is no reason to expect other units will die in shipping. Kael proposed to test PMTs before they are inserted into the sphere - to verify that they produce pulses. Albrecht said he wouldn't do this because he has never found a bad PMT. Rolf said you need skilled people to evaluate PMT pulses. Lars said such testing is not needed. Albrecht said that the PMT failure rate should be less than one in five hundred, that whenever we have complained to Hammamatsu in the past they were always right. Kael and Alan agreed - no incoming testing of the PMTs will be performed. Lars pointed out that the PMTs are dangerous, and we need precaution procedures on handling the PMTs - he wasn't too happy with what he saw in the PSL production room.

Production Room

Jim Hoffman stated that PSL has a special non-conductive floor. The non-electrostatic floor is important for handling the mainboard and the flasher board. The vinyl floor at PSL has resistance (ten to the fourth to ten to the sixth ohms). Jim said that you need to take precautions for the safety of the boards. Alan added "and for the safety of the people". Rolf asked if there were any special air purity conditions? Kael said we used normal air conditioned air.

Jim Hoffman added that there is no dust particle removal, and there are UV filters on the lightbulbs to filter out 0-350nm. They are cheap and easily implemented. Kael said that the gel should not be stored in any area longer than needed in a gel permissive environment. Rolf mentioned standard sodium lamps could be used.

Meeting Comes to an End

Albrecht stated that some important things need to be done soon. For instance, work needs to be done on the patch panels. We will need them. There will be a surface cable-device cable interface at the patch panel in the counting house, with another cable to go to the DOR card. We can all imagine it but it will be work to do the drawings and to make this happen. "In June someone will say, what about the patch panels? If you have some resources at your home institution...."

With the meeting coming to an end, Alan and Rolf stated that it had been a very nice and productive meeting. Kael suggested having a meeting in Europe, perhaps May of next year. Albrecht suggested that one of the students could stay longer. Albrecht wondered about the productivity of the collaboration meetings - that working groups in lecture halls are not a good place for roundtable discussions like this one. Rolf agreed, but stated that the more difficult question was how to do it. Albrecht suggested making the collaboration meeting a little shorter - a 2-day working group followed by 2 days of plenary meetings. Rolf said that it was hard to cover every topic at a collaboration meeting. Albrecht said that we want to make the Bartol meeting in March as useful as possible.

There was discussion about an upcoming conference call with the Monte Carlo folks to make sure the optical module characterization will be correct. Rolf said that there may be a lot of things we'd like to include but we want to keep things simple.

Lastly, there was discussion about the InIce devices meeting - at 10:30 on Monday mornings at PSL. The attempt is made to make it possible for both California folks and European folks to join in at the same time. It is a little late for the Europeans (5:30pm local time), and it was decided that there should be an effort to do the important stuff at the start of the meeting, and the more local stuff at the end. Kael also proposed, because of the sheer number of meetings on this project, that the technical board meetings should become biweekly. Albrecht said he would propose this to the technical board.