Summary of discussins and conclusion of the technical OTR meeting at NIKHEF 6.11.-7.11.03 F.E. 8.11.

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1. Templates;

it is agreed that the templates need some modification.This will lead to and has already led to major delays. The following conclusions have been reached:

a) the groove diameter is reduced by 100 micron to 5.2 mm to better fit to the straw diameter of 5.12 mm.
b) the template will get 'ventilation grooves' perpendicular to the grooves for the straws. This is necessary to avoid strong forces on the panel when it is glued to the straws by the air flow of the sucking system. There will be several grooves per half panel (for the first panel a total of 4 grooves is planned for each half)

Force on the straws, keeping them straight:
c) it has to be checkked if the number of sucking holes (presently every 23 cm) is sufficient.
==> NIKHEF will use their 5 m template in the next few days filled with straws to: i) measure (estimate) the height variations of the straws in the template. A too long distance between holes may produce too strong upward bends of a straw. (we expect that the number of holes is sufficient)**
ii) measure the force on the straws due to sucking for different gas flows. We need an idea how much force is needed to keep the straws in the grooves.

d) Heidelberg has made a systematic study how to increase the force on a straw for the same amount of gas leakage. The conclusions are:
ii) the force can be significantly increased for the same gas leakage by cutting a rectangular slit of 1 mm heiht and 1 mm depth across each sucking hole. A slit length of 12 mm gives a gain of 4 to 5.
iii) polishing the template in the neighbourhood of the hole reduces the leakage significantly -by more than a factor 2.
===> we can increase the force on the straws by adding slits and polishing by a large factor. This would give more safety and may allow to reduce the gas flow or pressure difference

DECISIONS how to proceed:
A new 5 m template with reduced groove diameter is ordered at Philips to be produced in week 46.
ii) Henk is asked to contact the company and ask for the additional ventilation grooves.
iii) he is also asked to discuss with them the possibility to add long slits at the sucking holes. This should however only be requested if it does not significantly delay the delivery.
v) the new template will be assembled first at NIKHEF and a panel 5 m panel with straws will be glued as fast as possible to compare it to the present template w.r.t. straw and wire position accuracy . This process will also show if the ventilation grooves solve the problem of vacuum force on the panel.

vv) NIKHEF will machine ventilation grooves to the short 3 m template for Warsaw (week 46) and send this template together with the other material necessary to build a 3 m module to Warsaw immediately afterwards.
Warsaw will send a person to NIKHEF to prepare the straws for this template.
NIKHEF will alos provide a strong vacuum pump for Warsaw.

Order of production templates:
a). NIKHEF is asked to reserve production slots to produce at least one more 5 m template and one 3 m template at Philips for begin of january.
b) ** we hope that the tests with the new 5 m template are finished middle of december... this should have absolute priority . NIKHEF agrees to do the acceptance measurements for the new template only after the panel has been glued.
c) If the tests are successful then the order for the production templates will be confirmed immediately eventually including a modification of succing holes and venntilation grooves.

*****we need these production tools at NIKHEF and Heidelberg begin of february.**

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2. improvement of module assembly:
a) straw and wire positionng: all groups by now report similar conlusions as presented last time by Heidelberg: the variation of wire positions are too large and the straws are bend too much. It is agreed that the main origin of this problem is the groove diameter which was 5.3 mm compared to a straw diameter of 5.12 mm. It is beleived that this problem will be solved to sufficient accuracy by the reduction of the groove diameter to 5.2 mm.
b) Heidelberg has closed a 1 m module and made gas leakage tests. The other two groups have not made an attempt to seal the straw volume w.r.t. the secondary gas volume.
The following results are reported:
i) there was sizeable leakage of teh gas box, mainly in the glue joint

between the panel and the wire feed through boards. This can be probably avoided by adding additional glue including ~30% of glass bubles to the surface of the PCB before gluinng.

ii) after sealing the outer gas volume from outside HD also tested the sealing of between straw and secondary gas volume. This sealing is very poor and insufficient. This esealing includes three critical steps:

a) sealing the slits between the endblocks: this was attempted by adding glue to the side wall of each block during assembly and by pouring liquid glue to the ends of the blocks on the straw side after the panel was glued to the straw

b) sealing between panel and endblock: this is expected to be most difficult because the taounge of the straw is passing there. It is recommended (HD) to add a strip of glue with 30% glass bubles along the endface of the endblocks (straw side) before panel glueing.

c) Glue joint between the endblocks of the upper and lower panel. This was done by using a filling glue with 50% of glass bublles.

Heidelberg had no way to find out where the leakage is.

NEXT steps:

1) Heidelberg will build a new 1 m module using improved gluing techniques.

2) Warsaw will build a second 1 m panel trying its best to seal primary and secondary gas volume. They are then asked to test this panel alone to find out if there are leaks and ev. where.

3) NIKHEF will try to seal the gas volumes of their 1m module after the straws are glued and then make measurements.

** Obviously the sealing of the two gas volumes will be difficult. We therefore also agreed to rediscuss the physics reasons which ask for this separation and the necessary amount of sealing. Sebastian Bachmann will give a report on that at the next meeting at CERN.

Heidelberg proposes to enlarge the width of the end blocks by 50 micron reducing the nominal distance between blocks to 50 micron. It was finally agreed that this is not done now but tha we wait for the next tests with reduced groove diameter.===> NIKHEF will order a new medium size batch of endblocks with the present geometry.

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3. check of material list for preseries modules:

up to begin of january we want to build the following modules:

a) a 3 m module at Warsaw

b) a new 1 m module at Heidelberg

c) 1 panel with straws (5m) at NIKHEF

In january NIKHEF and Heidelberg want to start building a 5 m module, begin of february, Warsaw wants to start the preseries production of short panels.

the stock list of materials has been checked at NIKHEF:

1. Wire endblocks and wire locators;

there are 1000 NEW endblocks of each type available (sufficient for 3.5 modules) and 4000 new wire locators.

In addition there are about 500 pieces each of old endblocks and wire locators which will be used for the first 3 m module at Warsaw.

==> we need new pieces already in january.

2. PCBS: there are only 9 wire feedthrough boards available and 9 middle boards + the corresponding components,just sufficient for the modules to be buildt up to february.

3. wire: only a small amount of wire is left, insufficient to even build the modules up to february.===> we have to get a few rolls very fast!!

4. Al end blocks: no more blocks are available. Warsaw will checkk within 4 days if they can provide endblocks for everybody for at least 10 modules.

If the answer is no then every group has to produce its own endblocks for the first few modules

5. small parts: plastics, gas pipes etc... here the situation is unclear (not yet known)

6. STRAWS ARE available. A new batch has already been ordered).

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4. straw cutting tools and el. contacts

Frans Mul presented the forseen machinery including a short version for Heidelberg and Warsaw.

His ideas are accepted and NIKHEF is asked to order three working places and at the same time produce the small parts needed. Heidelberg and Warsaw expect the straw cutting tooling begin of february. If htis time scale cannot be kept then the straws have to be confectioned at NIKHEF by NIKHEF.

The contact of the toungue and between Al and capton XC was discussed at length.Te default solution is still a long tounge (15 mm) and soldering on both sides. The alternative of crimping presented by NIKHEF looks very attractive. Nikhef is srongly encopuraged to develop this method further and see how the remaining problems can be solved.

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5. PANELS:

a) plastic insert: It is decided to use PEEK as material to produce the inserts. It can be bought in plates of correct thickness. The geometry of Jerzy Michalowski (throughgong holes) is accepted.
==> NIKHEF will order 1 plate of 1000*500*10 PEEK to be delivered to Crakow. Crakow is asked to produce end pieces and produce about 10 short panels with them in january (after completion of the side wall production).

b) holes in side walls: quantitative measurements of HEnk have shoown that these holes which look dramatic to the eye have a depth of only 200 micron. It does therefore not look necessary to fillt hem at Crakow. Side walls have however to be inspected for deeper holes at Crakow.

c) panel sheets: the sheet proposed by Leszek will need some modification, details will be communicated later.
d) the height of the side wall will be increased to ~34 mm. Official statement will be sendt by NIKHEF (Henk/Antonio)
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6. long term material provision. Heidelberg offers to take over long term responsibility for the provision of mechanical and/or elctronics material if wanted and needed. ==> to be decided by NIKHEF.

7. Jan, Ulli ans Sebastian will collaborate to produce a first fdraft of module production and test instructions.
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8. time schedule for module production:

THERE IS OBVIOUSLY A MAJOR DELAY OF THE START OF PRODUCTION COMPARED TO OUR LAST PLANNING. THIS HAS TO BE ATTACKED RIGOROUSLY.
A) TEMPLATE: hopefully the agreed modifications will solve the problems
B) PRODUCTION TECHNIQUE FOR MODULES: still a lot of problems to solve and improve
C) MATERIAL PROVISION: WE ARE LATE AND CRITICAL FOR ALL DELIVERIES. MATERIAL FOR A SIZEABLE SERIES MUST BE AVAILABLE BEGIN OF JANURAY. EVERY EFFORT HAS TO BE DONE TO GET IT ==> SEE ORDER LIST