Minutes of PLUME Phone meetings - 2010, November 26 & November 30-

J.Baudot

Participants

- **University of Bristol**: Joel Goldstein,
- **Desy, Hamburg**: Ingrid Gregor, Franziska Hegner, Ulrich Koetz
- **University of Oxford**: Rhorry Gauld, Andrei Nomerotski,
- **IPHC, Strasbourg**: Jrme Baudot, Nathalie Chon-Sen, Mathieu Goffe.

Agenda

The meeting was divided in two separated phone calls due to person availability. On Friday 26, we focussed on thermo-mechanical issues while on Tuesday 30 we discussed module related aspects. Agenda and slides are available at:

- http://indico.cern.ch/conferenceDisplay.py?confId=114210.
- http://indico.cern.ch/conferenceDisplay.py?confId=114212.

1 FEA simulations, Franziska

Franziska first updated us on her thermal simulations (still in natural convection for now). She studied how stitching might change the heat exchange along the ladder. Not unexpectedly, if the 6 sensors are part of the same silicon slab, the maximum temperature decreases by 20 °C compared to the single sensor case. However, if only two or three sensors are stitched, no decrease is observed but a slight increase. This behavior is also related by the frame of the copper grounding below the sensors, as already seen in previous simulation. As a conclusion, it is clear that any heat bridge between sensors help decreasing the peak temperature.
Using a different heat capacity for the insulating material (kapton, polyamide, polyimide) changed the maximum temperature only by a few degrees.
When the sensor power dissipation is decreased from 730 mW to 500 mW, the peak temperature decreases by 20 °C.

Franziska also presented the beginning of a mechanical stability study. The detailed model of our ladder has been implemented in I-deas. The first results concern the natural frequencies which starts at 137 Hz. The model will be refined and Franziska will try to couple it with the turbulence from the air flow.

2 Ladder assembly, Joel

Joel reported that the work in Bristol to assemble the ladder resumed. The design of the ladder support box (see http://www.iphc.cnrs.fr/IMG/jpg/plume2010_ladderConcept_withinBox.jpg) is now final and a first sample should be produced by the mechanical workshop in January. The assembly jig still needs a finalization of its design and then could also be produced in January.
Optimistically, we may expect the first ladder assembly in the first part of February.

3 AID box, Andrei

Stephanie is now doing FEA computation to estimate the stability of the ladder when hold only from one side and in horizontal position (if Z is the beam axis, the ladder would be oriented along X, the plane $X-Z$ defining the horizontal plane). When the ladder is oriented upward (sensor plane perpendicular to Y), the sagging at the free ladder end is maximum and amounts to 120 μm. When directly facing the beam (sensor plane perpendicular to Z), the sagging stays quite small (3 μm). Finally, in an intermediate position when the normal direction to the sensor plane is tilted by 45 $^\circ$ around the X axis, the sagging reaches 90 μm.
Those are still static simulation and the coupling to a potential air flow (for coolling) is still to be done.
These numbers show that this kind of sagging will not cause problem in the mechanical arrangement of ladders inside a layer of the AID. Also we expect an alignment procedure can cope with such sagging easily.

4 Tests of PCB equipped with 3 sensors, Nathalie

Nathalie showed the conclusion of the first detailed study of the sensor mutual influence on the flex. The measured voltage power (VDD-A and VDD-D) drop does not exceed 50 mv and do not prevent any of the sensors to operare. However, a shift in the average fixed pattern noise (or offset, or pedestal) of a given sensor has been observed at the mV level when other sensors on the flex are ON and tuned to a low discriminator voltage. This shift can not be neglected since its amplitudes is larger than the typical temporal noise of the sensor.
It is not yet clear if this effect will remain when the sensors operate with a high threshold (nominal setup). Nathalie will now move forward to evaluate the fake rate in nominal setup and performances of the sensors on the flex when stimulated with various sources.

5 Module assembly, Mathieu

Mathieu reported that the first module equipped with 6 MIMOSA 26 sensors has been assembled and bonded. The individual sensor placement is done manually but a specific

tool helps to maintain the alignment when gluing. Overall, the alignment is excellent (within 10 μm) and the bonding went also smoothly.
We took some risk by bonding all 6 sensors at a time, since if any of them has a short cut, none will work and the fault analysis will be painful. The smoke test will occur in the coming days.

We will wait for the first test results of this module before proceeding to a new assembly. By the way, the other populated OPTIPRINT flex needs some fixing on the passive component bonding.

6 New flex design, Rhorry

Rhorry reported about the design of the next flex which have been started by Pete in Oxford. It seems that all the traces fit into a 20 mm width. But we aim for a width around 15 mm (13 mm for the sensor and at most 2 mm for the bonding), so dedicated discussions should help to find out how to achieve this goal. Mathieu indicated the possibility to change the passive components type from 402 to 201.

Andrei has now an offer from OPTIPRINT with the smallest metal (13 μm) and kapton (50 μm) thickness achievable by them. He is still expecting an offer from the Kharkov institute.

7 Planning, action items, next meetings

Our next phone meetings should happen in the last part of January.

Action items triggered by the meeting:

- Bristol to send a foam piece, Oxford a bare GRAPHIC flex and IPHC broken sensors, all to DESY for the thermal mock-up,
- IPHC to send glue information to DESY,
- insure Pete has enough inputs for the next flex design.