Minutes of PLUME Phone meeting
- 2010, October 27 -

J.Baudot

Participants

- **University of Bristol**: Joel Goldstein,
- **Desy, Hamburg**: Lena Bachynska, Ingrid Gregor, Franziska Hegner, Ulrich Koetz
- **University of Oxford**: Rhorry Gauld, Andrei Nomerotski,
- **IPHC, Strasbourg**: Jrme Baudot, Nathalie Chon-Sen, Gilles Claus, Marc Winter.

Agenda

The meeting reviewed all the activities which occurred during the summer with a special emphasis on the organisation to move faster toward our milestones in the coming year: agenda and slides at http://indico.cern.ch/conferenceDisplay.py?confId=111564.

1 Thermal simulations, Franziska

Franziska has been working on thermal simulations since spring 2010 in DESY. She simulated a number of combinations with a flex made of FR4 or kapton, 1, 3 or 6 sensors operating and different metal thicknesses and arrangements for the traces as well as natural convection or a forced air flow (velocity O(ms)).
Several conclusions stem out of her work. Kapton flex seems to dissipate heat as efficiently as FR4. The copper grounding, being the largest material present in the flex, plays a major role in conducting the heat. The heat transfer is weakly impacted by the thickness of the metal traces (varied from 5 to 15 μm). When considering forced convection with a turbulent air flow on a single sensor, the temperature decreases only by 6 °C and does not seem to depend on the air velocity in the 0.5 to 2 m/s range. Joel suggested that the heat transfer may increase when 6 sensors operate since the exchanging surface grow larger. This is a first idea for a new simulation, awaiting also measurement with infrared camera corresponding to this situation.
Finally Marc made two other suggestions for future work. The first concerns the impact of decreasing the initial power dissipation of MIMOSA 26 to 500 mW (instead of the current 730 mW). The second idea relates to the possibility to have the exact same sensors disposition but stitched together. So the simulation shall consider a thin and long slab of silicon and predicts how the temperature equilibrates in this case.

2 Tests of PCB equipped with 3 sensors, Nathalie

Nathalie reviewed the intense summer activity to explore all the parameters impacting the sensor operation both on simple PCB-proxy board or on the PCB-flex. This study is not entirely completed and an additional month is required to conclude on the best operational point. Also the characterization of the sensors operating together on the PCB-flex is ongoing with different sources and for temperature measurements. Nevertheless there is no show stopper to prevent the mounting of 6 MIMOSA 26 on a kapton-flex in parallel.
Nathalie also mentioned the jumper cable (going from the flex to the auxiliary board) has to be redesigned because of a signal-coupling detected on the previous version. There is a resistor value to be changed on the flex that Nathalie will communicate to Pete.

Finally, we can move ahead with mounting sensors on two flex provided by Optiprint which shall be sent to Strasbourg after they have populated in Oxford (2 additional bare flexes being sent as well). According to the planning of the technical team here in Strasbourg, the first module shall be ready early in December.

3 Flex Optiprint-version and outlooks, Andrei

We received excellent news from the Optiprint flex batch inspection in Oxford which have a much better quality thant observed with Graphic. Electrical tests are ongoing but, as mentioned earlier, already 3 of them are being populated with components.
Andrei introduced to us a new potential vendor from Kharkhov, Ukraine. This lab already has a history of collaboration with HEP experiments (ALICE) and will soon provide us a quotation for the current design. They offer very open options for the thicknesses of the kapton and metal and also aluminium. We all agree that we shall order samples to them but did not yet converged on the specifications.

We discussed with Andrei the path to design the next flex which have to exhibit a lower width (having the traces below the sensor) and a lower metal thickness. It is not yet clear wether the kapton thickness shall be very lower than 50 to 100 μm because the flatness has an important role for the gluing step. It appeared clearly we are still missing some precise guidance for this design but agree that it should start now if want to meet our final goal in 2012. Questions arising from the designing phase will be answered thanks to the ongoing tests. It was also clear that we will have the chance for only one new major design (with potentially small iterations). This new design has the priority with respect to the production of the mirror version of our current design; though already done, it does not represent a significant step toward our objectives.
The organisation of this new and final design shall be a major point of our next meeting discussion.

After the flex discussion, Andrei turned to the AID-box item. The simulations to decide about the fixture, one or two-sided, of the ladder are advancing well. A first design

was put to reality thanks to a 3D printer in Oxford which could be useful to produce mock-ups.

4 Power pulsing and laser test in DESY, Lena

Lena reported on the progress with power pulsing in DESY. The setup allows now to measure (from MIMOSA 26 analog outputs) the pedestal and noise evolution with time when the power pulsing is activated. "back-to-normal" time after power-on were estimated but low-frequency wiggles are observed on the pedestal. Marc reminded that MIMOSA 26 is not optimized for power-pulsing and that such oscillations will be filtered out in a dedicated sensor. Very grossly this "back-to-normal" time corresponds to ten frames (each 450 μs duration) so about 4 ms.
The work will now turn to the tests with signals provided by a laser, once the laser setup is fully understood.

5 Mechanical assembly status, Joel

Joel explained us that, though all parts are now in Bristol and the assembly tools have been designed (see previous meeting), the assembly itself was not done due to lack of manpower. The task is now resuming but there is only a chance to get the two mechanical modules to be mounted on a foam before Christmas.
However, Joel assures that after the first assembly it will be a matter of days to assemble the next ladders.

6 Status of analysis on 2009, Rhorry

Rhorry is a new PhD student working with Andrei in Oxford. He spent 6 weeks in Strasbourg learning to use the TAF software used by IPHC for beam test data analysis. He applied it to the 2009 PLUME data with non-90 degrees incident angle but faced an alignment difficulty. This was also met with MIMOSA 26 data with tilted detectors with respect to the beam and partly solved. The final spatial resolution at normal incidence was even improved by 0.5 μm.
The alignment problem of tilted planes is now understood but still await a completed (automated) solution on which both Rhorry and Jerome are working on.

7 Planning, action items, next meetings

We focus the planning discussion on the fact that we have not moved fast enough to meet our goal in 2012 which is to demonstrate an operational double-sided ladder with 0.3 to 0.4 % of X_0. The main point appears to be the design, production, sensor assembly-on and test of the flex. In this context, Jerome committed himself to produce two documents. The first is a summary and explanation on how to calculate the thickness of the present design (2010) and of the targeted design (document now ready:

http://www.iphc.cnrs.fr/plume.html#doc). It should help defining the proper path for our development. The second document is a preliminary presentation of the milestones, with dates, we need to achieve in the coming two years. The latter will be discussed and finalized for mid-December and should serve as a reference to evaluate our progresses in the future.

Our next phone meetings should happen end of November and the next one around mid-December.

Action items expected to be done by then are:

- start of assembly of ladder with mechanical modules,
- finalization of tests of the PCB-flex with 3 sensors (GPF1),
- assembly of at least one module with functional MIMOSA 26 on a Optiprint flex,
- start of the final flex design,
- more thermal and mechanical (AID-box) simulations.