



Minutes of general PLUME meeting at CERN - 2012, November 20-21 -

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Participants

- **University of Bristol:** Joel Goldstein,
- **Desy, Hamburg:** Ingrid Gregor, Oleg Kuprash (remotely), Ulrich Koetz, Inna Makarenko
- **IPHC, Strasbourg:** Jrme Baudot, Gilles Claus, Mathieu Goffe, Michal Szelezniak.

Agenda

The meeting focused on the activity report from each group after quite a long period without any meeting. We also acknowledge the leaving of our Oxford colleagues and discuss the internal re-organisation.

The agenda and the slides are available at:

<http://indico.cern.ch/conferenceDisplay.py?confId=215589>.

1 Power pulsing studies in DESY reported by Oleg

Using the board and software made available by IPHC, the DESY team set up a power-pulsing test bench for a single MIMOSA 26 sensor. It is reminded that both the analog and digital powers are switched off, except for a minimal biasing. This strategy is expected to reduce the power consumption by 6 with a 200 ms cycle, but was not

explicitly measured.

It was first observed that with a 180 ms power off time, the temperature gradient over the sensor drops to 2°C, from 8°C without power pulsing. An analysis of the fake hit rate was performed in time bins with respect to the start of the power ON. It was observed that 4.6 ms (about 40 frames) are needed to establish a stable rate. The final rate is in agreement with the one obtained without any pulsing, only if some cooling is performed (18°C water flow).

This duration corresponds very well with the previous analog noise study. It is expected that this time is due to the loading of the line capacitance and not really related to the wake-up time of the sensor. Anyway, it demonstrates the feasibility of power pulsing for a future test beam.

Future actions include the measurement of the discriminator transfer curve and the response to a laser when power pulsing. These will be taken over by Inna which is expected to visit IPHC early next year.

2 Bristol activities on mechanics, Joel

The necessary SiC foam samples for the next prototypes assembly, 20 pieces, 2 mm thick and 4 % density, have been delivered to Bristol. They are guaranteed with $\pm 100 \mu\text{m}$ flatness.

The tools to glue the new narrow modules on the foam has been redesigned. There is no major changes on the concept. They were adapted with respect to the smaller module width and avoid the use of the clamp in the previous prototype. Most of these tools have been already produced by the Bristol workshop. From the experience gathered with the previous prototype, Joel expects that assembling a ladder will take about 3 days.

Joel reported that manpower for the ladder assembly is still not stabilized in Bristol. While he hopes the issue to be solved, we considered the possibility to have a second assembly site. A duplication of the assembly tools is possible in Bristol but shall be arranged some month in advance. We will have to review the situation next Spring.

We finally discussed the need for additional ladder boxes, used for transport and testing. We agreed for an amount of 3 more boxes for now.

A modification of the lateral air inlets driving the air inside the box was requested. Indeed it was observed that air is mostly blown on the box wall instead of being directed toward the sensors.

Also, we asked Joel to consider the possibility of an extension to fit 2 ladders on top of each other within a single box. Ideally, this arrangement would allow an overlap between 0.1 to 1 μm and a tilt angle between the two ladders of $\pi/12$ or $\pi/6$.

3 Activities in Strasbourg, flex and modules, Jerome

The new version (2011) of the flex cable is available since some time, both with copper (from Optiprint) and aluminum (CERN workshop) traces. The current schedule in Strasbourg includes validation tests of these cables in January 2013, to move quickly toward the bonding of first sensors on them if all goes well. After the validation of the first flex equipped with one sensor, the mirror version will be ordered (it has already been designed in Oxford). This means that the first couple of fully equipped module and mirror-module could be ready for Spring 2013.

The procedure with the automatic machine for the assembly of modules (sensors on flex) is moving forward with a delivery date around March 2013. The first modules mentioned above will be assembled by hand but the successive ones will use this automatic procedure.

4 Discussion on 2013 test beam and data acquisition

At sometime in the last quarter of 2013, we will need to test in beam our new ladder(s). It is clear that the only possibility will be to go to DESY and we agreed that an official beam time shall be requested. Two telescopes could be used for the test, either the IPHC one or the resident DATURA EU-telescope.

Because such a test beam will involve the acquisition of both the MIMOSA 26 sensors from the telescope (4 sensors for the IPHC and 6 for the EU-telescope) and the MIMOSA 26 sensors from the ladders, we discussed the different DAQ system options. Taking into account that the minimum number of sensors to consider on a ladder is 4 (2 on each side) and that two ladders could be included in the test, the total amount of sensors to read range from 8 to 30.

DAQ solutions for the lowest part of this range exist both at IPHC and DESY, they will only require some preparation and checking in advance of the test. Considering the many sensors option involves some development, at least from the IPHC side.

To allow maximum flexibility, we decided that the highest priority at IPHC is the synchronization with the TLU board, if any development time could be allocated for it. On the DESY side, a review of available hardware boards is necessary to evaluate the actual feasibility of an acquisition with a large number of MIMOSA 26.

5 AID-box status

We recognized that the AID (Alignment Investigation Device) box project is stalled. We first review the situation left by Oxford: some remotely controllable stages, some drawings for the ladder fixture on the stages and a basic support structure. All those things, hardware and drawing are being gathered by Jerome in Strasbourg with the help of Rhorry. But there is a clear lack of a general plan, especially concerning the critical

issue of air-cooling with respect to mechanical stability.

To handle this situation we decided to first established clear goals for the tests foreseen with this device and then a development strategy staged from a simpler system to the original complex box. A simpler system could for instance consists in two small PLUME-ladder-support boxes, containing each two ladders fixed in a barrel-like orientation, and in the middle a small box using the already acquired stages to position two additional ladders in tunable positions. Having separated boxes, equipped with their respective cooling, to support each station (made of two ladders each) alleviates the difficulty of a multi-ladder air-cooling while supporting ladders only by one end.

Since the meeting, Marc wrote a detailed test plan which is available either on the INDICO meeting site or on the PLUME web page, which now features a AID-box section. We shall refine our plans at our next meeting in view of this proposed program and available hardware as well as money.

6 Other businesses

- Ingrid reported that a student in DESY will investigate the possibility to estimate the radiation length of a given plan by measuring the electron beam deviation it generates, thanks to the beam-telescope. This study will be performed in 2013 and could be extremely useful for the PLUME project.
- Mathieu and Jerome visited the CERN Quality Assurance & Reliability Testing Lab (<http://bondlab-qa.web.cern.ch/bondlab-qa/QA.html>), where a small setup with a magnet allows to record the vibration of wires used for bonding. The discussion with the expert points to the fact that the frequencies we deal with (5 Hz for pulsing, 80 MHz for sensor clock) are outside the known hazardous frequencies for the resonance of the wires, which lie in the 10-50 kHz range. In fact, only the JTAG signals use this kind of frequencies but with a current so low that the effect shall be harmless.

Next meeting

We agreed that the next meeting shall take place before March 2013.