



Minutes of PLUME phone meeting - 2012, January 11-

J.Baudot

Participants

- **University of Bristol:** Joel Goldstein,
- **Desy, Hamburg:** Ingrid Gregor, Oleg Kuprash, Ulrich Koetz
- **University of Oxford:** Rhorry Gauld, Andrei Nomerotski,
- **IPHC, Strasbourg:** Jrme Baudot, Mathieu Goffe, Michal Szelezniak, Marc Winter.

Agenda

This meeting was mostly dedicated to the preliminary results of our double-sided ladder (2010 design) test in the SPS beam and to the schedule for the fabrication of the new ladder (2011 design). We also had a very interesting report on the development of the laser test facility in DESY.

Some announcements were made concerning people leaving and joining the project:

- Oleg Kuprash is a PhD student in the DESY group, who will work for PLUME up to August 2012,
- Michal Szelezniak joined the Strasbourg group as a test ingenier and will share his time between the PLUME and the STAR-PXL project,
- Loc Cousin is a new PhD student in Strasbourg, who will mostly work within the AIDA project and therefore is involved in the PLUME data analysis,
- Nathalie Chon-Sen left the Strasbourg group (for a permanent position),
- Joel reported that the technician usually working for PLUME in the Bristol Workshop is now retired and that some re-organisation is on-going.

The agenda and the slides are available at: <http://indico.cern.ch/conferenceDisplay.py?confId=>

1 Preliminary results of the November beam test, Loc

Loic reported on the overall success of the 1 week data taking at CERN-SPS during last November. Over 80 runs were acquired with the beam bombarding the ladder at different locations covering all the sensors and with various incident angles (30 to 60 degrees). The air cooling was observed to be more efficient on one side than on the other side but

allows a smooth operation of the ladders for days.

We were able to characterize all sensors for efficiency, fake hit rate and spatial resolution. The hit-track residual standard deviation reveals that the individual sensor resolution is the $3.5 \mu\text{m}$ expected, thus assessing the mechanical stability of our ladder. The efficiency and fake hit rate behave as expected with the discriminator threshold. However it was impossible to lower the threshold to reach efficiency higher than 99.5 % and fake hit rate higher than 10^{-4} per pixel. This effect is currently under investigation.

Early study with mini-vectors, made of two hits on both sides of the ladder, allowed to evaluate a spatial and angular resolution, respectively of 2.5 ± 0.1 (prelim.) μm ($\sim 3.5/\sqrt{2}$) and 0.11 ± 0.1 (prelim.) degrees against the expected 0.14 degrees.

We agreed that these preliminary results could be made available as plots with the preliminary tag on the PLUME web page (<http://iphc.cnrs.fr/PLUME.html>). We discussed a number of further possible studies. Though data are now stored in Strasbourg, they can obviously be made available to anybody in the collaboration.

2 Laser tests in DESY, Oleg K.

Oleg reviewed the status of the laser test setup supervised by Uli. The 905 nm wavelength light is now focused on a $5 \mu\text{m}$ spot and synchronized with the analog data acquisition of MIMOSA 26. The generated amplitude can be varied from MIP-like to much higher levels and cluster shape (typically 3×3) can be studied. However it is noticed that the response amplitude is very much dependent on the location of the spot within the pixels, probably due to reflexion on the metal traces network at the chip surface. Study of the diode relaxing time, using two pulses separated at various time intervals, was conducted, to conclude that this relaxing time is in the range 60 to 120 μs as expected. The setup is clearly ready to continue on the earlier studies done by Lena on power-pulsing.

Further plans include data acquisition with the digital 0-suppression mode (a visit in Strasbourg around mid-february should allow to gather the necessary hardware), power-pulsing with the digital acquisition, studies with the MIMOSA 28 sensors and finally with the full ladder.

A solenoid (1.5 T, 25 cm diameter, 1 m long) is available in DESY. We shall establish a clear interest to asses a working program with this device or dismiss its potential usage for us.

3 Further tests of the 2010-design ladder

We already mentioned that evaluation of ladder performances with a pulsed power is foreseen with a laser and potentially within a magnetic field. This is also a goal for this year test beam with the new ladder.

We are still missing a mechanical survey of our ladder. It is not clear at all that the RAL setup used last time could be used again. The same situation prevails for the vibration measurements. Everybody is welcomed to propose an alternative solution. Currently only our collaborators from STAR in LBNL could provide such a setup. This issue shall be solved in the coming month.

4 Early test of the Optiprint Kapton Flex 2011, Rhorry

The flex designed in 2011 with the narrow width of 18 mm has been fabricated by Optiprint in a copper version. The width and separation dimensions of the traces stay the same as in 2010 but the thickness is reduced to 15 μm . Rhorry observed the clock signal shape at the output of the flex for different frequencies ranging from 100 to 220 MHz. The 100 MHz frequency is validated while signal deformation is clearly observed at higher frequencies. However, it is not clear whether the 100 Ohm resistor used insured the best adaptation.

The next step will happen now in Strasbourg with the bonding of one sensor on the flex to check the full functionality.

Andrei mentioned that Pete seems to be available to design the mirror version of the flex needed to assemble a narrow ladder (the current 2010-design ladder suffers for a large width due to the shift of the module needed to match the sensitive areas on both sides). A dedicated meeting between Oxford and Strasbourg should happen shortly to review the design constraints on the mirror flex

We are expecting the flex with aluminum traces fabricated at CERN any time in January. The best (quality and lead time) aluminum flex fabrication is not at all assessed so far. We need to investigate further providers.

5 New ladder in 2012: design and schedule

The new ladder shall be equipped with the narrow flex designed and fabricated in 2011 (18 mm width) and its mirror version to be fabricated in 2012. The ladder width should hence not exceed 18 mm. There is an open issue related to the width of the SiC foam. We agree it could be narrower than the flex but did not conclude by how much. We agree that the foam density shall be 4 % to reach our material budget goal. This density was shown not to degrade significantly the mechanical stability by Franziska's simulation.

A rough schedule was decided to reach two functional ladders with the new design in September 2012, only milestones are indicated here (no preparation work for various tools or tests):

- February** mirror flex designed and sent to fabrication, test of new flex equipped with one sensor,
- March-April** first assembly test of the new module with the automatic placement machine in Strasbourg,
- May** test of the first module, reception of the mirror flex and assembly of a mirror module,
- June** tests of more modules (including mirror version),
- July-August** assembly of ladder(s),
- September** functionality test of ladders.

We target to have a beam test in October.
The production of the ladders for the AID-box will start in 2012-Q4.

6 Discussion

Communication

With the results we have already accumulated we can make rich communications to workshops and conferences, especially keeping in mind the feed-back we shall provide for the ILD-Detailed Baseline Document. This is a non-exhaustive list:

- all AIDA meetings for packages 9.3,
- ILC ACFA meeting, [KILC](#) (23-26 April, Daegu),
- Workshop on Intelligent Trackers, [WIT](#) (3-5 May, Pisa), Jérôme is proposing an abstract,
- [Pisa Meeting](#) (20-26 May, Elba),
- ILD meeting, Kyoshu University, (May 23-25, Kyoshu),
- VERTEX (? June, ?),
- <http://iworid2012.fis.uc.pt/> (1-5 July, Coimbra),
- [PIXEL](#) (3-7 September, Inawashiro),
- [LCWS](#) (22-26 October, Arlington),
- [IEEE-NSS](#) (29 Oct. - 3 Nov., Anaheim).

Actions

- make available the preliminary beam test results,
- ensure, anybody can access the beam test data,
- evaluate the possibility of the power pulsing test inside a magnet,
- finalize the new ladder design,
- mechanical survey and vibration measurement of the 2010-design ladder,

Next meeting

We agreed that the next meeting shall take place as a phone call next February.