

Minutes of WP-meeting 152

Attendance:

DESY: Ties Behnke, Stefano Caiazza, Isa Heinze, Felix Müller, Volker Prahl, Christoph Rosemann, Klaus Zenker

Webex: Paul Colas, Mathu Dixit, Philippe Gross, Leif Jönsson, Martin Killenberg, Gilles de Lentdecker, Bo Li, Ron Settles, Akira Sugiyama, Jan Timmermans, Wenxin Wang, Jochen Kaminski

PCMAG/LP setup, test beam:

Christoph: PCMAG

- All tests (including excitation and quenching) were completed by June 9th. Everything is working fine. Several sensors still have to be set-up/updated in the control system. Still some issues have to be worked on to pass the safety clearing.

LP

- The LP has been closed and flushed with gas. HV test have proven, that it stands up to 20 kV at the cathode and no discharges were observed in a test of 72 hours. During installation it was observed, that one of the two HV connectors at the cathode was broken internally. It could be fixed, but a better system needs to be developed for the next field cage.

test beam schedule

- Paul will test his new Micromegas-modules from 3rd of July to the 14th. The DESY-group will start its test end of July. A clear schedule is not possible yet (s. below). There is also no date for the tests of the Micromegas module with ALTRO-electronics.

News from the groups:

Leif: - Adapter cards from the AFTER-electronics connector to the ALTRO-electronics connector have to be designed before the testing the Micromegas modules.

Paul: - SACLAY is struggling to finish as many modules as possible before the test beam: All the FECs will probably be ready by next Monday, but only one modules is finished. Two more modules will be finished very soon. They will be glued on the frame this week. Possibly another two modules can be finished before the test beam, but it will be difficult. Calibration of the electronics and the modules is going on.

Stefano: - The DESY-group is waiting for the pad plane. A first set failed the electrical tests of the producer and has to be re-produced. The GEMs are almost all tested and currently a guard ring around the top GEM is prepared to reduce the field distortions.

Discussion on magnetic field issues:

Ron gives a summary on the solenoid and the magnetic field distortions. He gives a reminder of the ILD decision from 2010 to remove the correction coils. They would improve the figure of merit $\int Br/Bz dz$ from 50 mm to 35 mm. This improvement was found too small to warrant the correction coils (which also complicated the design of the solenoid). The inhomogeneities degrade the spatial resolution $\sigma_{r\phi}$. To keep the influence tolerable the degradation because of the B-field should not be larger than 30 μm . This would lead to a small increase of the $\sigma_{r\phi} \approx 100 \mu\text{m}$, which is due to diffusion and other effects: $\sqrt{(100 \mu\text{m})^2 + (30 \mu\text{m})^2} \approx 105 \mu\text{m}$. The 30 μm is a goal and can be larger if the systematic errors are distributed in a random nature along the track. To achieve this the B-field inhomogeneities must be well known and corrected for during the reconstruction. To reach the necessary level of accuracy the field must be known everywhere down to 1-2 G, which is a relative

precision of 10^{-5} . To reach the necessary accuracy the number of measuring points of the field map must be greatly increased and will be an interesting engineering challenge. Simulations have shown that field inhomogeneities in ϕ must be known to a higher degree than the ones in r for the correction during reconstruction. However, it is still doubtful if this field measurements alone will be precise enough and further tools may be necessary, for example, using $Z \rightarrow \mu\mu$ events. Experiences from ALEPH showed, that it is also a good idea to plan for more than one B-field measurement campaign. At ALEPH some mistakes done in a first extensive campaign could not be corrected in a second one. All this has been summarized in the LC-note: LC-DET-2011-002 / ILC-NOTE-2011-061
Ron also reminded the audience that the PCMAG also has field distortions in the order of a few percent and is therefore an ideal test bed.

Bo gave a status report on his work to incorporate the corrections of non-homogeneous magnetic fields. Previous discussions have led to the agreement, that a major contribution of the momentum resolutions is because of the limited momentum resolution of the test beam at DESY. Therefore, the development of the code should be based on MC data, so that a verification of the code could be done on an event by event basis. Bo has, thus, modified several MarlinTPC processors, so that track can be simulated in inhomogeneous magnetic fields. He has succeeded in loading the field-map of the PCMAG and has simulated several sets of tracks with 40 - 50 GeV. He has then tested several versions of track fits with uniform and non-uniform magnetic field maps, but none of them showed satisfactory performance. Therefore, he decided to update the current Kalman fitter Kaltest to take inhomogeneities into account. Work on this has finished and he will start testing the Kalman fitter on simulated tracks next. It was also suggested by the audience to produce a MC set of 6 GeV electrons, which would be more similar to the data taken by the LP.

In the following discussion it was pointed out that an external tracker is badly needed to measure the track parameters precisely for every event. Christoph reminded everyone, that almost all necessary parts are available at DESY to build a copy of the ZEUS hodoscope. However, the readout FPGA still needs to be programmed which may need only a few weeks for an experienced programmer or 3 months for a beginner. Jochen suggested that if it should prove difficult to recruit someone for this task, a Gossip-based hodoscope could be considered. Maybe recruitment would be easier for this, but it still needs verification if the resolution would be sufficiently good.

AOB:

The next workpackage meeting will take place on July 5th with a discussion on electrical field homogeneity and analysis of LP data.