Minutes of WP-meeting 155

Attendance:
DESY: Felix Müller, Ralf Diener, Isa Heinze, Leif Jönsson, Christoph Rosemann, Klaus Zenker
Webex: Purba Bhattacharya, Philippe Gros, Jochen Kaminski, Martin Killenberg, Nayana Majumkdar, Astrid Münich, Ron Settles, Jan Timmermans, Wenxin Wang

PCMAG/LP setup, test beam:
Ralf: LP

- Ralf reported on the inspection of the field cage, where a module slipped and fell on it (~15th strip from anode). He showed some pictures of the location. At the beginning there were some metallic spikes. Therefore, the larger bump was grounded with sandpaper and afterwards thoroughly cleaned with wipes and alcohol. Electric tests showed no connectivity between different strips or ground, but good connectivity along the electrodes. HV-test have not been performed yet.

Felix

- Felix reported on a survey of the 10 dummy modules. He measured the height of the modules from the O-ring grove to the top side, which should be 32.45 mm, on all four corners. 6 of the modules show a good agreement (< 50 µm) of both the average of the 4 corners and a small spread of the 4 measurements. 2 of the modules are off by more than 150 µm and a third one has a small deviation of the average, but quite large discrepancies of a 4 corners from the mean. The copper plate of the last one came off, so the last 4 of the modules have to be redone, but there are 6 good dummy modules, which is sufficient to do a test beam.

Ralf: test beam schedule

- DESY plans to start the beam test on August 20th.

News from the groups:
Felix: All parts for the new DESY modules have been delivered and the assembly of the modules will start soon.

Martin reported on the test of the Micromegas group to use the track making Kalman filter. This failed, because many parameters in the processor were hard-coded. For example the use of three modules, module position, drift velocity, diffusion, magnetic field etc. were hard-coded and some information of the GEAR-file were even overwritten. Martin is currently working to modify the processor so it has the expected flexibility. A first compiling version is available, but hasn't been tested yet. A unit test to compare the results of the previous version with the new version is also planned. At the end Martin asked everyone to be more careful during code development to avoid problems like this in the future: No values should be hard-coded and no compiler flags which modify the code behavior should be used!

Discussion on electric fields:
Ralf summarized the field simulations and calculation done mostly by Peter Schade: The best option for a fieldcage would be a resistive foil, but the necessary resistivity is not available. Therefore, strips with a pitch of 2.8 mm (SMD mounting) and a width of 2.3 mm (inter-strip HV considerations) were chosen for the Large Prototype. Thus, a coverage of 80% with copper was reached minimizing the influence of charge up. The electrical fields were calculated with a FEM program called CST. From this

the field deviation ΔE/E and the displacement of charge depositions was determined. A field deviation of less than 10^{-4} results in a degradation of the spatial resolution from 100 µm to 105 µm. Additionally, the radial displacement on charge depositions was calculated by summing over all deflections in 200 µm wide steps. The results of several mirror strip geometries were shown and the current design of two identical field strips on both sides of the kapton foil displacement by half a pitch was shown to give the best result. An alternative design using half the number of resistors was also discussed, but there the field homogeneity of 10^{-5} was reached only 9 mm from the field cage, while for the current design a distance of only 5 mm was calculated. With this method also several imperfections like tilting of the anode, the cathode and the axis were studied. It was shown that the tilting of the endplates has only a limited influence on the field homogeneity, while the tilting of the axis has a much stronger influence. The tilting should not exceed 50 µm, but the Large Prototype features 500 µm. This yields a field homogeneity of 10^{-3} in the largest part of the drift volume. The reason for this tilt was an imperfection of the mandrel, which has been worked over at the DESY workshop to meet the precision requirements. Since a second sheet of ring electrodes is available, DESY plans the construction of a new field cage. It is still under discussion if the construction will be done at DESY or at an external company. Further studies performed by Peter deal with the influence of a variation of resistors. The resistors of LP1 have $R = 1\ M\Omega \pm 50\ \Omega$. These variations as well as the finite resistance of the wall and the 1 mm gaps between the endplates and the respective field strip. This amounts to some local field distortion in the order of 10^{-4} which reach up to 50 mm into the drift volume.
Finally, several effects coming from the anode and cathode were studied: For example the effect of holes in the cathode and anode with a diameter of 5mm, which could be used for example as openings for laser light. These wholes give quite significant field distortions and a more advanced design will be necessary. The holes for example could be covered with grids so that the laser absorption is minimal, but the homogeneity of the electric field is reestablished.
Also, in influence of the flatness of the gas amplification stage (e.g. GEMs) were looked at and showed that some small effects could be expected up to 20 cm into the drift volume. In this study the 1 mm gaps between the modules was not even included, but Klaus Zenker calculated it at a later date.
As a conclusion it was stated, that the current implementation of the LP does not fulfill the required field homogeneity and a new one should be built. As far as the field simulations and calculation is concerned a good understanding has been reached, but a few question have not been addressed: Open questions are the effect of the unevenness of the cathode and the charge up of the kapton foil between the the ring electrodes.

AOB:
The next workpackage meeting will take place on August 16th.