Minutes of WP-meeting 380

Attendance:
Zoom: Paul Colas, Ulrich Einhaus, Keisuke Fujii, Jochen Kaminski, Peter Lewis, Andreas Loeschcke Centeno, Shinya Narita, Carsten Niebuhr, Huirong Qi, Oliver Schäfer, Ron Settles, Jan Timmermans, Maxim Titov

Presentation on TPC at Belle 2;
Andreas Loeschkce Centeno gave a presentation on a first study, whether a TPC can be operated at an upgraded Belle2/3 experiment. At the current situation the central drift chamber (CDC) is showing first signs of limitation as the inner layers start to saturate. For a possible upgrade a new tracker has to be found. The center of mass energy will be at the Y(4S) resonance but with asymmetric beam energies: positions (E=4 GeV) and electrons (E=7 GeV). The instantaneous luminosity is planned to reach $L=6.5x10^{35}$ 1/cm²/s. To reach the high luminosity the accelerator would run a in top-up mode, which means that injections are done with a rate of 50 Hz, and bunch crossings would be every 4 ns. The magnetic field is B = 1.5 T. The dimensions of the TPC are: length =2.3m, inner diameter=0.45m and outer diameter = 1.14m. The inner volume now covered by the CDC would be filled with more layers of the vertex detector (VTX). Besides a fast timing layer outside of the TPC would be necessary for trigger decisions. The simulation was done in the Geant4-based Belle framework basf2, in which Andreas has implemented a TPC with a GridPix like readout with a pixel size of 55x55µm². He showed some event pictures that were simulated and then explained the event overlay to get overlapping events with a total time span of twice the maximum drift time (30 µs). He also added several backgrounds: Babhas, qqbar continuum, QED bkg. and various beam bgks. He demonstrated that most of the backgrounds could be eliminated and the initially clear Y(4S) events could be recovered. For differentiating between tracks of different bunch crossings but same times of arrival at the endplate, the track width can be exploited to distinguish the drift distance/time of the track.
Andreas showed, that a combination of TPC could reach the same performance as the CDC + VTX as far as momentum resolution is concerned. The lower occupancy after bkg removal and a better dE/dx resolution are in favor of the TPC, but have to be studied in more detail with a more realistic simulation tool.
A maximum trigger rate of 150 kHz is expected, allowing no active gating. Therefore, the ion accumulation is of concern. A first estimate gave an ion density of 0.74 fC/cm³ including the physics events and the aforementioned backgrounds. However, the injection backgrounds have not been included yet, as they are very difficult to model in a simulation. Experience from the current Belle2 operation shows, that this is the dominant background and can surpass the other backgrounds significantly. When presented to the Belle2 collaboration the opinion was split between great interest and large skepticism, the latter mostly based on the missing injection background

General News:
Several people were contacted to give a presentation CEPC workshop from the 24-28th of October. It was not clear, if these were partially request for the same presentation to different people. It seems, that Peter and Paul give presentations in the gaseous detector session and Peter gives another one in the mechanics+MDI session.

AOB:
The next workpackage meeting will take place on October 27th.