FCC-hh General Design Meeting

Notes from the meeting held on 17th March 2016

The presentation on collimation updates from A. Lachaize was postponed to the collimation meeting on 18th March.
X. Buffat presented last time luminosity lifetimes which were slightly different from before. This was due to different cross sections for loosing protons. This opened the question what happens with the protons. J. Molson has a new version of pp elastic scattering simulation which has a significant impact on luminosity lifetimes.

James Molson - 100TeV pp beam beam elastic interactions

J. Molson presented pp elastic scattering simulation. No data for 100TeV exists and different models could be used, however it is not clear yet which one is correct. Extrapolation could potentially have large variation at 100TeV for small model parameter changes. The differential cross sections were presented. Plots were shown for the scattering fraction versus the scattering angle for different crossing angles.

- D. Schulte comments that for a divergence of 15μrad which is the ultimate parameter, all elastic scattered particles remain in the beam. 1μrad corresponds to the absolute minimum divergence which we would have for 5ns bunch spacing and the beta-function from the baseline parameters. In a normal run one would probably have 5μrad, which means that one only looses a fraction of the particles. X. Buffat adds that for LHC the elastic scattered particles stay in the beam as well

Andrea Apollonio - FCC Availability Studies

A. Apollonio presented availability studies for FCChh. Availability is defined as a measure of useful time for user experiments. For a collider the key parameter is luminosity. The optimal availability is a trade off between costs for design/construction and life cycle operational costs. For these studies LHC was used as a reference point and extrapolations were done for FCChh. These extrapolations show that a very high availability of the injectors chain is crucial for the availability of FCChh.
One method for increasing the availability of a mechanical system was presented which is the predictive maintenance. It was shown how a problem with cryogenic valves at LHC could have been detected before it became an issue in operation.
A Monte-Carlo based software was introduced which is used for the modelling of the availability in complex systems. For LHC these simulations reproduce very accurately the actual luminosity that was achieved in 2012.
Future studies should focus on a definition of a cycle duration, as well as an analysis of the different injector options. A strategy for the scaling of the different components needs to be identified. An extension to FCCee might be possible, however it is more difficult as expertise and data is lacking for (large) lepton machines.

- F. Zimmermann asks how the LHC availability can be increased from 70% to 90% as it was used in the assumptions. A. Apollonio replied that it is not operated at 6.5 TeV and only as an injector (no squeeze etc.)
- D. Schulte asks if one could compare the fraction of luminosity for the whole run compared to what one would achieve in perfect conditions. R. Schmidt replies that one should consider the whole operational cycle, as it is done in these simulations.
- B. Holzer asks when would these simulations be able to tell e.g. how many cryo stations one should buy etc. R. Schmidt comments one should ask the other way around. The simulations can tell you what availability is needed for sub components to achieve the aspired total availability and optimisations can be done based on these informations.