Brief minutes of the meeting reports and discussions

Time and location: 2021. 02. 05, C407 Main Building

Attentee: GAO Jie, ZHANG Jingru, LI Xiaoping, WANG Dou, WANG Yiwei, MENG Cai, DUAN Zhe, Xia Wenhao

1. DUAN Zhe gave an introduction of the approach to realize longitudinal colliding beams in CEPC-Z, and reviewed some previous work on beam polarization maintenance in the booster.

Related questions and discussions:

* 1. WANG Dou and WANG Yiwei: The top-up injection interval is not explicitly included in the formula of the average beam polarization. How does it affect the average beam polarization? DUAN Zhe pointed out that the formula is taking the limit of continuous injection, as long as the injection interval is much smaller compared to the beam lifetime (top-up injection), the formula gaves a quite accurate estimation of the average beam polarization. If the injected beam has a higher beam polarization compared to the equilibrium beam polarization, then the beam polarization varies between the maximum value just after each injection and the minimum value just before the next injection.
  2. GAO Jie and MENG Cai: the implementation of spin rotator in the low-energy transport line also needs special treatment, and shall be listed as a separate task. MENG Cai concerns about the chicane structure in the low-energy transport line and high-energy transport lines, whether the polarization direction is changed in these regions needs more investigation.

1. LI Xiaoping introduced the principle of DC photocathode gun to generate polarized electron beams, and gave tentative parameter specifications of CEPC polarized electron gun, after a comparison with similar devices developed elsewhere.

Related questions and discussions:

* 1. GAO Jie: the specification of the beam emittance needs to be appended, LI Xiaoping commented the beam emittance is expected to be smaller than that of the beam generated from a thermionic gun, some simulations can be launched to give more quantitative results.
  2. DUAN Zhe: physics experiments might need reversal of the polarization direction of some bunches, how frequent can the laser polarization be changed to reverse the electron beam polarization direction. LI Xiaoping said changing the laser polarization every 1 second is considered to be doable, going to even higher frequency needs more detailed investigation.
  3. MENG Cai and LI Xiaoping: the depolarization in the main linac is believed to be small, the polarization loss in the bunching system and the chicane sections can be studied with some analytical evaluations, how to do simulations with BMAD code will be studied.
  4. LI Xiaoping: Currently we don't have fundings to manufacture a polarized electron gun, the detailed production and process procedure of the cathode material is quite beyond the knowledge of we accelerator people, we can do some more detailed optimization of the DC photo-cathode electron gun.

1. XIA Wenhao presented the recent simulation studies of the equilibrium beam polarization in the CEPC collider ring, the spin rotator design and progress in spin matching of the spin rotator section.

Related questions and discussions:

* 1. GAO Jie: what is the conclusion of the simulations of the equilibrium beam polarization in the CEPC collider ring with asymmetric wigglers. DUAN Zhe and XIA Wenhao replied, the current simulation of one specific setting of asymmetric wigglers, shows sufficient beam polarization can be generated via self-polarization in a limited time (~3hours), which can support using resonant depolarization method to monitor the beam energy throughtout the colliding experiments. Detailed analysis of the resonant depolarization procedures, deduction from the measured non-colliding beam energies to colliding beam energies, is a much involved task, and is separate from our current main goal.
  2. WANG Yiwei and DUAN Zhe, spin matching through eliminating the G matrix components should be combined with matching the twiss parameters of the two sides of the spin rotator insertion. Will discuss off-line regarding how to provide input for WANG Yiwei’s redesign of CEPC-Z lattice.
  3. GAO Jie: more efforts should be put on the design of snakes, and implementation in the booster.