



Contribution ID: 1354 Contribution code: TUPA116

Type: **Poster Presentation**

Development of polarized H and D atomic beam source at IMP

Tuesday, 9 May 2023 16:30 (2 hours)

Polarized beam is an effective tool in basic research. An Electron-ion collider in China (EicC)*, as a future high energy nuclear physics project, has been proposed. EicC can provide good research conditions for precision measurements of the partonic structure of nucleon or nuclei and the study on the interactions between nucleons and so on. High quality polarized beam is helpful to the accurate measurement of the relevant experiment date. Polarized proton and deuterium (H&D) beam source is one of the key technologies for EicC. Based on the atomic beam polarized ion source (ABPIS) scheme, a polarized H&D ion source with polarization more than 0.8 and beam current more than 1mA is under construction at the Institute of Modern Physics (IMP), providing theoretical and technical support for the design and construction of EicC polarized source. In the ABPIS, the separating magnet ensures the electron polarization and the effective transmission of the atomic beam; the radiofrequency transition(RFT) unit ensures that the electronic polarization is converted into desired nuclear polarization. In order to generate high intensity and high polarization H&D atomic beam, these assemblies need to be precisely designed and optimized. In the paper, an effective method for obtaining the optimal sextupole separating magnet structure will be described in detail; the numerical simulation of the method of adiabatic passage, the design and testing of the RFT units will also be discussed.

Funding Agency

The national key research and development program 2020YFE0202004

Footnotes

- D.P. Anderle, etc., Electron-ion collider in China, Front. Phys. 16 (2021) 64701. <https://doi.org/10.1007/s11467-021-1062-0>.

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Session Classification: Tuesday Poster Session

Track Classification: MC3: Novel Particle Sources and Acceleration Techniques: MC3.T01: Proton and Ion Sources