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Design study of a compact IH-DTL-based injector for proton therapy facilities

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A new proton injector based on the 425-MHz radio frequency quadrupole (RFQ) and interdigital H-mode drift tube linac (IH-DTL) has been designed. The injector is ~7 m long and comprises an electron-cyclotron-resonance (ECR) ion source, a low-energy beam transport, an RFQ, an IH-DTL, two triplets, a medium-energy beam transport, and a debuncher. The IH-DTL is specially designed with two tanks with different bunching phases, which can contribute to excellent transverse and longitudinal beam quality. The ion source produces an 18-mA proton beam with the energy of 30 keV. The output energy of the injector is 7 MeV with the transmission efficiency of 86.2%. A three-dimensional electromagnetic simulation was conducted, and the results agreed with the design. A systematic and mechanical design of the entire proton injector was also performed for the following research and development. The injector has great performance and is planned to be utilized in Shanghai ATRACTRON Proton Therapy facility (SAPT). In the future, it can also promote advanced proton accelerators for medical applications.

Footnotes

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Asia

Primary author: LU, Yixing (Shanghai Synchrotron Radiation Facility)

Co-authors: FANG, Wencheng (Shanghai Synchrotron Radiation Facility); GUO, Yusen (ShanghaiTech University); XIAO, Chengcheng (Shanghai Synchrotron Radiation Facility); ZHAO, Zhentang (Shanghai Synchrotron Radiation Facility)

Presenter: LU, Yixing (Shanghai Synchrotron Radiation Facility)

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