An improvement of ACCSIM code and the stripping injection simulation

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Abstract: A dedicated carbon-ion therapy synchrotron, known as HIMM (Heavy Ion Medical Machine), is designed and now under construction. Stripping injection scheme of heavy-ion is adopted to inject and accumulate beams in a synchrotron which serves as the main accelerator of the machine. In order to do the simulation study of the injection process and to evaluate the performance of the designed injection system. An improvement to a particle tracking code ACCSIM is performed to support interactions between heavy-ions and stripping foil. The improvement concerned mainly on three aspects: a) charge exchange effect between carbon ions and stripping foil; b) multiple Coulomb scattering of incident heavy ions on stripping foil; c) energy loss of particles in foil and the energy loss straggling. Based on the improvement the accumulation process are simulated and the parameters related to the injection system are optimized. The gain of the particle number is achieved and the emittance and the momentum spread growth as well as central momentum shift is obtained.

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