

BEAM DYNAMICS AND EMITTANCE GROWTH DURING FINAL BEAM BUNCHING IN HIF DRIVER SYSTEMS

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Research efforts on a heavy ion fusion (HIF) have been concentrated on the control and transport of space-charge-dominated beams in the accelerator system. In particular, the beam dynamics in the final section is expected to involve a lot of unclarified physical problems. For an efficient implosion of a fuel pellet, the intense heavy-ion beam should be longitudinally compressed in the final stage of HIF driver system. While the longitudinal compression is carried out in the final buncher, the beam must be transported without significant emittance growth and excessive non-uniformity. Using particle simulations, we have investigated the beam dynamics during the final bunching [1-2]. The space charge oscillation may induce instability in the beam transport [1], thereby emittance growth and modulation of transverse distribution during the final beam bunching. The emittance growth accompanied by the longitudinal compression is estimated by the numerical simulation with various initial particle distributions. After the final bunching, particle distributions inside the beam are evaluated in the uniformity on the transverse cross section of the beam [2]. Obtained results should provide us a useful information for design of the fuel pellet, for study of beam transport in a reactor chamber, and for consideration of optimum scheme of multi-beam illumination onto the target.

- 1 T. Kikuchi, M. Nakajima, K. Horioka, Beam Dynamics Simulation in Final Beam Bunching of Heavy Ion Inertial Fusion, *Journal of Plasma and Fusion Research*, **79** (2003) 105-106; T. Kikuchi, M. Nakajima, K. Horioka, T. Katayama, *submitted to Physical Review Special Topics - Accelerators and Beams*
- 2 T. Kikuchi, M. Nakajima, K. Horioka, T. Katayama, *to be published by Journal of Plasma and Fusion Research*, **80** (2004).