NUMERICAL ANALYSIS CORRESPONDING WITH EXPERIMENT IN COMPACT BEAM SIMULATOR FOR HEAVY ION INERTIAL FUSION DRIVER

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In heavy ion inertial fusion (HIF), which is inertial confinement fusion driven by heavy ion beams, space charge dominated beam physics is critical research topic [1]. Because the beam parameters are far from the conventional heavy ion beam produced by the current particle accelerator complex [2].

The heavy ion accelerator is undoubtedly needed for HIF, however the large size is a problem issue for the HIF research and development. For this reason, compact beam simulators with electrons were proposed and developed [3,4,5]. Not only the experimental approaches but also the numerical analysis with multi-particle tracking was carried out according to the experimental condition [6,7]. In particular, longitudinal pulse compression is critical manipulation in the final stage of HIF driver system.

In this study, the numerical simulation results are compared with the experimental results for the compact simulator. Figure 1 shows the computational box for the numerical simulation corresponding to the experimental condition. Multi-particle tracking based on particle-particle method is carried out [8]. The electrons are transported through the solenoid line after the modulation gap. At the gap, the longitudinal velocity of electrons is applied with the voltage produced by induction modulators for the drift compression.

Figure 2 shows the beam current waveforms at 1.93 m after the gap. The beam current was compressed as about 20 times in comparison to the initial one. The numerical results are discussed with the experimental results at each condition.

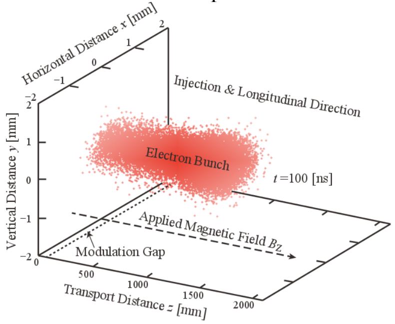

Fig.1: Computational box.

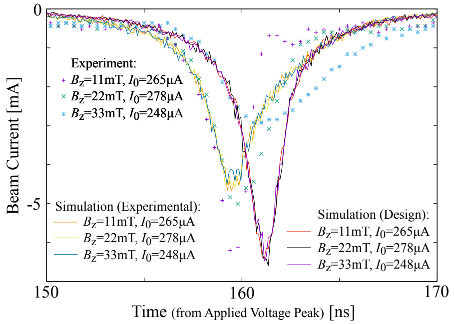

Fig.2: Beam current waveforms after compression.

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