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Recent Activities on Heavy Ion Inertial Fusion in Japan

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Recent activities on heavy ion inertial fusion in Japan are reviewed in this paper. Particle accelerator development, beam dynamics research, interaction between heavy ions and target material, ion source development, and illumination scheme of heavy ion beams, for heavy ion inertial fusion, are reported.
Inertial confinement fusion scheme driven by intense heavy ion beams, so-called Heavy Ion Inertial Fusion (HIF), is a method to release nuclear energy by nuclear fusion reactions of prodigious proportions. When the intense heavy-ion beams illuminate a fuel target pellet, the target pellet is heated up due to interactions between the ion beams and the target material. As a result, implosion process is driven by ablation plasma in the target pellet.
In the HIF system, the related researches in particle accelerators and charged-particle beams including with the beam-material interaction are unique topics in comparison with other nuclear fusion systems. Also, common research topics such as properties of warm dense matter (WDM) are in the field of HIF studies. For this reason, the researches in Japanese HIF group are focusing to the related themes in the particle accelerator, the charged-particle beams, the interactions between the beam and the material with the solid, WDM, and plasma conditions.
The particle accelerator development is a crucial issue for HIF study, and the KEK digital accelerator brings a solution. The beam dynamics research, the interaction between heavy ions and target material, the ion source development, and illumination scheme of heavy ion beams are also unique research topics for HIF. Not only the above unique topic in HIF, but also the WDM research is an important problem for nuclear fusion system, and the studies were carried out by using the experimental setup based on pulsed power technique.

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Primary author: Prof. KIKUCHI, Takashi (Nagaoka University of Technology)

Co-authors: Prof. HASEGAWA, Jun (Tokyo Institute of Technology); Prof. OKAMURA, Katsuya (High Energy Accelerator Research Organization); Prof. HORIOKA, Kazuhiko (Tokyo Institute of Technology); Prof. TAKAHASHI, Kazumasa (Nagaoka University of Technology); Prof. TAKAYAMA, Ken (High Energy Accelerator Research Organization); Prof. KONDO, Kotaro (Tokyo Institute of Technology); Dr OKAMURA, Masahiro (Brookhaven National Laboratory); Prof. KAWATA, Shigeo (Utsunomiya University); Prof. SASAKI, Toru (Nagaoka University of Technology); Prof. JIANG, Weihua (Nagaoka University of Technology); Dr IWATA, Yasushi (National Institute of Advanced Industrial Science and Technology); Prof. OGURI, Yoshiyuki (Tokyo Institute of Technology)

Presenter: Prof. KIKUCHI, Takashi (Nagaoka University of Technology)

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