Contribution ID: **126** Type: **Invited talk**

Design considerations for a wobbler in a HIF driver

Thursday, 16 August 2012 10:50 (20 minutes)

Hong Qin, Ronald C. Davidson
Princeton Plasma Physics Laboratory, Princeton University
P. O. Box 451, Princeton, New Jersey, 08543 USA

B. Grant Logan, Lawrence Berkeley National Laboratory, Berkeley, California, 94720 USA

Beam wobbler systems have been recently proposed for heavy ion fusion system to achieve uniform deposition of the beam energy onto the target [1-6]. The currently envisioned wobbler systems consist of sets RF voltage driven plates on the beam path, which can be used to actively control the centroid dynamics of the beam. By choosing appropriate RF voltage wave-forms, different slices of the beam can be delivered to different locations on the target. The benefits of using such a beam wobbler system are two-fold. First, uniform energy deposition reduces the amplitude of the initial seeding for the Rayleigh-Taylor (RT) instability such that it takes longer for the RT instability to reach a larger amplitude Secondly, the time-modulation of the energy deposition due to the wobbler system also generates a significant dynamic stabilization effect for the RT instability [3,5,7]. These two effects are combined to make the beam wobbler system a useful tool for suppressing the RT instability for heavy ion fusion systems. This paper describes recent theoretical and numerical investigations of the dynamics stabilization of the RT instability with a time-dependent drive. It turns out the essential dynamics can be described by an extended Courant-Snyder theory. It is found that the reduction of growth rate has a complicated dependence on the modulation waveform. But in general, slower modulation has a larger stabilization effect.

Research supported by the U.S. Department of Energy.

[1] H. Qin, R. C. Davidson, and B. G. Logan, Laser and Particle Beams 29, 365 (2011).
[2] H. Qin, R. C. Davidson, and B. Grant Logan, Phys. Rev. Lett. 104, 254801 (2010).
[3] S. Kawata, T. Kodera, Y. Hisatomi, et al, Journal of Physics: Conference Series 244, 022003 (2010).
[4] S. Kawata, K. Horioka, M. Murakami, et al, Nucl. Instr. and Meth. A 577, 21(2007).
[5] S. Kawata, T. Sato, T. Teramoto, E. Bandoh, et al., Laser Part. Beams 11, 757 (1993).
[6] A. R. Piriz, N. A. Tahir, D.H.H. Hoffmann, and M. Temporal, Phys. Rev. E 67, 017501 (2003).
[7] R. Betti and R. L. McCrory, Phys. Rev. Lett. 71, 3131 (1993).

Primary author: QIN, Hong (Princeton Plasma Physics Laboratory)

Presenter: QIN, Hong (Princeton Plasma Physics Laboratory)

Session Classification: Drift compression and final focus - Chairs: A. Golubev and R.A. Kishek - Featured Posters: A. Friedman, A. Burke, C. Helsley, Y. Sakai