

Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Ladder Climbing and Autoresonant Acceleration of Plasma Waves¹ IDO BARTH, ILYA DODIN, NATHANIEL FISCH, Princeton Plasma Physics Laboratory, Princeton University, Princeton, NJ 08543 — When the background density in a bounded plasma is modulated in time, discrete modes become coupled. Interestingly, for appropriately chosen modulations, the average plasmon energy might be made to grow in a ladder-like manner, achieving up-conversion or down-conversion of the plasmon energy. This reversible process is identified as a classical analog of the effect known as quantum ladder climbing, so that the efficiency and the rate of this process can be written immediately by analogy to a quantum particle in a box. In the limit of densely spaced spectrum, ladder climbing transforms into continuous autoresonance; plasmons may then be manipulated by chirped background modulations much like electrons are autoresonantly manipulated by chirped fields. By formulating the wave dynamics within a universal Lagrangian framework, similar ladder climbing and autoresonance effects are predicted to be achievable with general linear waves in both plasma and other media.

¹Supported by NNSA grant DE274-FG52-08NA28553, DOE contract DE-AC02-09CH11466, and DTRA grant HDTRA1-11-1-0037.

Ido Barth
Princeton Plasma Physics Laboratory, Princeton University

Date submitted: 21 Jul 2015

Electronic form version 1.4