Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Collisionless electron heating in periodic arrays of inductively coupled plasmas UWE CZARNETZKI, Institute for Plasma and Atomic Physics, Ruhr-University Bochum, KHRISTO TARNEV, Department of Applied Physics, Technical University-Sofia — A novel mechanism of collisionless heating in large planar arrays of small inductive coils operated at radio frequencies is proposed [1]. A periodic array of multiple coils provides a well-structured, dynamic electric field which allows resonant electrons moving in the plane to gain high energies. Two types of tailored periodic structures are studied. In the ortho-array currents in all coils are in phase while in the para-array currents in adjacent coils are 180° out of phase. The concept is investigated analytically by solving the Vlasov equation and by a single particle simulation combined with Monte Carlo collisions with Argon atoms. Scaling parameters, resonances, energy exchange, and distribution functions are obtained. Analytical and numerical results are in good agreement. Pressure and electric field dependences are studied. Stochastic heating is found to be most efficient when the electron mean free path exceeds the size of a single coil cell. Then the mean energy increases approximately exponentially with the electric field amplitude.

[1] U. Czarnetzki and Kh. Tarnev, Physics of Plasmas **21**, 123508 (2014)

Uwe Czarnetzki
Institute for Plasma and Atomic Physics, Ruhr-University Bochum

Date submitted: 19 Jun 2015 Electronic form version 1.4