Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Microwave-plasma interaction in the Undulator Induced Transparency regime and its applications MIKHAIL TUSHENTSOV, GENNADY SHVETS, The University of Texas at Austin — A numerical modeling of a plasma-microwave interaction in the Undulator Induced Transparency (UIT) regime is presented. UIT is a phenomenon originating from the coupling between the transverse and longitudinal electromagnetic waves (EM) in a magnetized plasma in the presence of the static helical magnetic undulator, which eliminates the absorption of an EM wave at the cyclotron frequency. A radical transformation of the plasma properties in the UIT regime results in slowing down of the EM wave propagation and the extreme compression of the wave energy. We are envisioning a microwave pulse compression in the plasma with the subsequent rapid change of plasma or undulator parameters. This UIT-based high power switching technique is of interest to microwave electronics. Another signature of the UIT regime is that the phase velocity of the plasma wave can be made opposite to the phase and group velocity of the incident microwaves which opens up the possibility to design a plasma-based Backward Wave Oscillators (BWO). The direct application of UIT to electron and ion acceleration is suitable due to the fact that the polarization of the compressed waves is primarily longitudinal and their phase velocity is controllable by the undulator period. Our numerical simulations extend the UIT concept to three dimensions and use an experimentally feasible plasma and magnetic field configuration.

Mikhail Tushentsov
The University of Texas at Austin

Date submitted: 15 Jul 2005 Electronic form version 1.4