

APR08-2007-000046

Abstract for an Invited Paper
for the APR08 Meeting of
the American Physical Society

Pressure ionization and phase transition in strongly coupled plasmas at megabars

VLADIMIR FORTOV, IHED RAS

The investigation of electrical conductivity and thermodynamic properties of strongly coupled nonideal plasmas quasiisentropically compressed by reverberating shock waves up to megabars was carried out. HE-driven generators of intense shock waves were used for generation of warm and dense strongly non-ideal plasma with intense interparticle interaction and mixing Fermi-Boltzmann statistics. Flash highly resolved X-ray diagnostics were used to measure adiabatic compressibility of the plasma. The thermodynamic measurements demonstrate density increase at megabar pressure just in the density range where the electrical measurements have shown sharp – five order of magnitude – electrical conductivity increase due to pressure ionization in strongly coupled plasmas. These thermodynamic experimental data in combination with the electrical conductivity measurements were interpreted as the experimental signature of the specific phase transition in strongly non-ideal plasma. The existence of this new phase transition is supported by the ab initio Quantum Monte-Carlo, Density Functional Theory, and Molecular Dynamic simulations. Pressure dielectrization in shock compressed Li, Na, Ca was detected and discussed.