EXCITED STATES OF WARM DENSE MATTER

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There is a number of papers treating WDM produced with fs X-ray lasers (see e.g. [1] and references therein). They call the state of matter produced as even a *"new form of plasma"* [2]. WDM produced with lasers is most widely discussed. However there are other sources of WDM generation as well. Ion beams are considered in [1]. WDM nanochannel is formed at propagation of a fast single ion through condensed matter [3]. Great amount of deposited energy in nanosecond exploding wires is suggested to explain by creation of strongly nonequilibrium solid-state-density plasma [4]. Similarity and diversity of WDM states produced are discussed in this work.

Some important properties of the matter are similar for all above mentioned methods of WDM production. It is a transient but steady (quasi-stationary for a short time) state of non-equilibrium, uniform plasmas. There is no reference to nonideality, both ideal and nonideal plasmas can be formed. Lifetime limiting processes are electron-phonon exchange, recombination, collisional electron cooling *etc*. Plasma formed in WDM retains solid state density and has two temperatures. Electron temperature is about tens eV. Ions remain to be cold and keep original crystallographic positions. However electron band structure and phonon dispersion are changed due to inverse influence of the electron excitation [5, 6]. Redistribution of the electron density after the electron temperature increase can result in the paradoxical hardening of the lattice. The ion cores survive after ionization of outer shells. Spectral line spectra are emitted by the ion cores embedded in electron plasma environment which influences the spectra strongly. The suppression of spectral lines in WDM is discussed. The main differences between different WDM states are discussed.

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