

Abstract Submitted
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Nonlinear Interactions in Dense Quantum Plasmas PADMA SHUKLA, Ruhr Universitat Bochum — The purpose of this talk is to discuss some important collective processes in dense quantum plasmas, which are ubiquitous in micromechanical systems and ultrasmall electronic devices, in nanowires, in biophotonics, in intense laser-solid density plasma interaction experiments, as well as in astrophysical and cosmological environments. In dense quantum plasmas, which obey the Fermi-Dirac distributions, there are new pressure laws and new quantum forces. The latter are responsible for novel collective interactions at nanoscales in the Fermi plasma. We shall describe the underlying models for dense quantum plasmas and shall discuss new aspects of the quantum fluid turbulence as well as the formation of nanostructures (quantum electron holes and quantum electron vortices) associated with nonlinear plasmonic oscillations. The results of computer simulations reveal interesting dynamics of quantum electron vortices. Furthermore, the nonlinear interactions between intense photons and plasmons exhibit the trapping of localized photons into quantum electron holes. The relevance of our investigation to laboratory experiments and astrophysical settings is discussed.

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