

Theoretical Studies of Long Lived Plasma Structures

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We discuss the model for the description of the long lived spherical plasmoids based on the electron oscillations in plasma. Spherically symmetrical oscillations of electron gas in plasma are studied on the basis of classical electrodynamics as well as in frames of the quantum mechanical approach, using the non-linear Schrödinger equation. We obtain that both classical and quantum spherically symmetric oscillations can exist. Unlike the classical solution, quantum oscillations reveal the typical length scale of the system, where the most intensive oscillations happen. The stability of the obtained solution is considered.

We put forward the hypothesis that spherically symmetric oscillations of electrons in plasma can underlie the existence of a ball

lightning (BL). The characteristic features of our model are compared with observed properties of BL. We also discuss the possibility that micro-dose nuclear fusion reactions, which can take place in the central region of the system according to our model, can serve as the internal energy source of BL.

Finally we consider possible experiments where high frequency spherically symmetric plasma structures can be generated.

I. M. Dvornikov and S. Dvornikov, in *Advances in plasma physics research*, vol. 5, ed. by F. Gerard, Nova Science Publishers, Inc., 2007, pp. 197-212, physics/0306157.