

Abstract Submitted
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Evidence of a new quantization constant in collisionless plasmas

GEORGE LIVADIOTIS, Southwest Res Inst — Recent plasma analyses revealed strong evidence about the value and nature of the new quantization constant \hbar_* , that is similar to the Planck constant \hbar , but 12 orders of magnitude larger. Planck's constant constitutes the phase-space quantum for individual and uncorrelated particles, while the new constant \hbar^* describes the phase-space quantum for particle systems characterized by local correlations, such as collisionless plasmas. In plasmas, long-range interactions induce local correlations, manifested by the presence of a correlation length between particles. This divides the system into an ensemble of clusters of correlated particles. The particles within each of these “correlation clusters” participate altogether to this new type of quantization. Quantum mechanics requires the existence of a non-zero least action, the quantization constant, but do not provide its specific value. The new developments point toward a new quantum-mechanical approach that will be based on the new quantization constant. If true, plasmas can be studied in a new way, following the framework of quantum and statistical mechanics, but on a much larger scale.

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