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Quantum oscillations in the kinetic energy density: Gradient corrections from the Airy gas ALEXANDER LINDMAA, Linkoping University, Department of Physics, Chemistry and Biology (IFM), Linkoping Sweden, ANN E. MATTSSON, Sandia National Laboratories, Albuquerque, NM, RICKARD ARMIENTO, Linkoping University, Department of Physics, Chemistry and Biology (IFM), Linkoping Sweden — We show how one can systematically derive exact quantum corrections to the kinetic energy density (KED) in the Thomas-Fermi (TF) limit of the Airy gas (AG). The resulting expression is of second order in the density variation and we demonstrate how it applies universally to a certain class of model systems in the slowly varying regime, for which the accuracy of the gradient corrections of the extended Thomas-Fermi (ETF) model is limited. In particular we study two kinds of related electronic edges, the Hermite gas (HG) and the Mathieu gas (MG), which are both relevant for discussing periodic systems. We also consider two systems with finite integer particle number, namely non-interacting electrons subject to harmonic confinement as well as the hydrogenic potential. Finally we discuss possible implications of our findings mainly related to the field of functional development of the local kinetic energy contribution.

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