

Abstract Submitted
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Coupled collective modes in electronic systems of different dimensionalities¹ BEN YU-KUANG HU, The University of Akron, EUYHEON HWANG, Sungkungkwan University, South Korea and The University of Maryland, College Park, SANKAR DAS SARMA, The University of Maryland, College Park — We consider electronic collective modes in coupled systems in which the individual components have different dimensionalities. Many-body diagrammatic techniques are used to derive formal results for the screened intra- and inter-system Coulomb interaction. We specifically investigate the case of a quasi-one-dimensional quantum wire in close proximity to a two-dimensional electron gas. We evaluate the screened intra- and inter-system Coulomb interaction within the random phase approximation, and find the existence of modes which have hybrid properties characteristic of both one- and two-dimensional systems. We also investigate the spatial dependence of the coupled 1-d + 2-d collective modes within the two-dimensional electron gas, and show that the coupled modes within that layer vary from being purely two-dimensional in character far away from the quantum wire to being strongly hybridized close to the wire.

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