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Collective modes in coupled electronic systems of different dimensionalities[1] BEN YU-KUANG HU, Univ of Akron, E.H. HWANG, Sungkyunkwan University — We consider electronic collective modes in coupled systems in which the individual components have different dimensionalities. Many-body diagramnatic techniques are used to derive formal results for the screened intra- and inter-system Coulomb interaction. We evaluate the screened intra- and inter-system Coulomb interaction within the random phase approximation. We 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. We existence of modes which have hybrid properties characteristic of both one- and two-dimensional systems. We also find that in certain circumstances, the coupling between the one- and two-dimensional plasmons causes the one-dimensional plasmons modes experience significant damping and essentially disappear.

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