

## Effects of Extension and Overlap of Wavefunctions on Plasmon Modes in Symmetric Double-Quantum-Well Structures

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**Abstract:** We investigate the effects of extension and overlap of wavefunctions on the dispersion relations of plasmon modes in symmetric double-quantum-well structures. We compare the approximate results in two-dimensional layer-gas (2DLG) model with the exact ones where the extension and overlap of the wavefunctions are included. Our numerical results show that the 2DLG model is a good approximation only in the wide barrier case in the long wavelength limit. When the barrier is thin, the extension and overlap of the wavefunctions cannot be neglected. We also show that the long wavelength gap of the inter-subband mode is proportional to the energy difference between the ground and the first excited energy levels.

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