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Minigap plasmons in a periodically modulated two-dimensional electron gas: single-particle necktie spectra HIROYUKI SAKAKI, Institute of Industrial Science, University of Tokyo, Japan, MANVIR KUSHWAHA, Institute of Physics, University of Puebla, Mexico — We investigate the plasmon excitations in a two-dimensional electron gas (2DEG) subjected to a one-dimensional (1D) weak periodic potential. We derive and discuss the dispersion relations for both intrasubband and intersubband excitations within the framework of Bohm-Pines' random-phase approximation (RPA). For such an anisotropic system with spatially modulated charge density, we observe a splitting of the 2D plasmon dispersion. The splitting is caused by the superlattice effect of the charge-density modulation on the collective excitation spectrum. In addition, We observe how the energy-tunneling allows the intersubband single-particle excitations (SPE) to attain a finite width at the zone center and to contain the gaps inside. The resulting gaps inside the intersubband SPE give rise to an intriguing structures of *neckties* appearing at the zone boundaries in the excitation spectra illustrating plasmon energy versus Bloch vector. We discuss how the tunneling and the potential amplitude affect such a *necktie* spectrum.

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