## Abstract

Electronic excitations in single- and double-layered one-dimensional electron systems (1DES) were investigated using inelastic light scattering (Raman spectroscopy). Particularly, the influence of an external electric field was studied. Starting from modulation-doped GaAs-based single or double quantum-well structures, arrays of quantum wires were fabricated by holographic lithography.

In the single-layered 1DES, we could observe a 1D wavevector dispersion of the intrasubband plasmon which is clearly different compared to that of a two-dimensional electron system (2DES). The influence of the width of the electronic system or rather the 1D electron density on the intra- and intersubband plasmons was investigated using two models.

The influence of an applied negative voltage increases the excitation energy of 1D excitations whereas it decreases the energy of 2D excitations. The different behavior could be attributed to the influence of sidegates which leads to different geometrical conditions.

Besides optical plasmons in double-layered 1DES, we could observe acoustic 1D intersubband plasmons for the first time. By applying an external electric field, which influences on the one hand the 1D electron density and on the other hand the symmetry of the

double quantum-well structure, we could study several interesting physical effects. Regarding the optical 1D intersubband excitations, we observe discontinuities in the excitation energies with respect to the variation of the applied voltage; we consider this behavior to be caused by a redistribution of the carriers of the underlying 2DES.

From the observation of acoustic plasmons, we could identify particular symmetry points in the underlying double quantum-well potential. Because of the lack of theoretical investigations of 1DES with strong tunnel coupling, the measurements were interpreted in terms of simple considerations of the density distribution of the spatially separated electron systems.