

Motivation

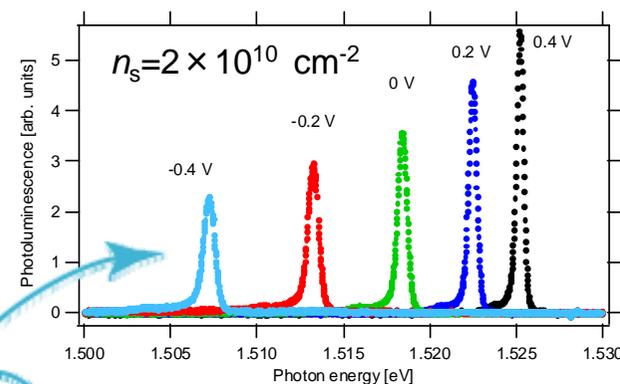
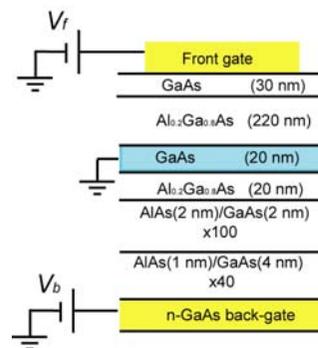
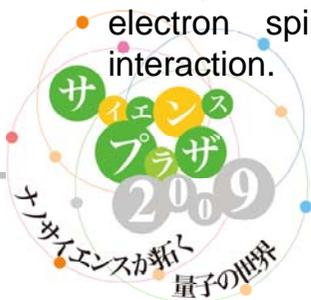
Clarifying the effect of the random potential on the properties of the low-density two-dimensional electron gas (2DEG) formed in undoped GaAs quantum wells (QWs).

Originality

PL measurements were performed while the electron density and electric fields were controlled independently. We clearly observed the widening of the PL linewidth with increasing perpendicular electric fields and suppression of the widening with increasing electron density. These phenomena are due to scattering by the random potential at the interface of the QW and the screening of the random potential by the 2DEG.

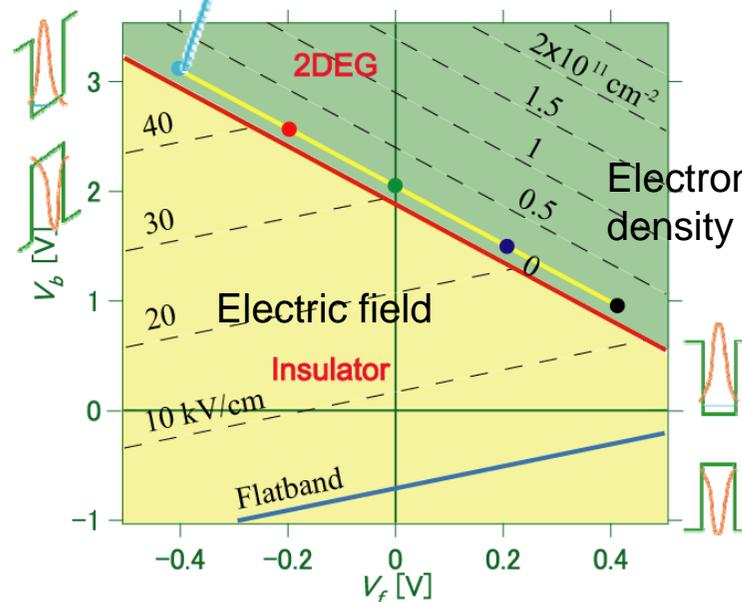
Impact

The contribution of the electron-electron interaction to the 2D electron system strongly depends on the electron density at low density. Clarifying the contribution of the random potential is important for understanding the low-density 2DEG properties as well as for controlling the electron spins by means of the electron-electron interaction.



Double-gate undoped GaAs QW.

PL spectra at low temperature: PL linewidth depends on the electric field.



Electron density and electric fields can be controlled by front and back gates independently.