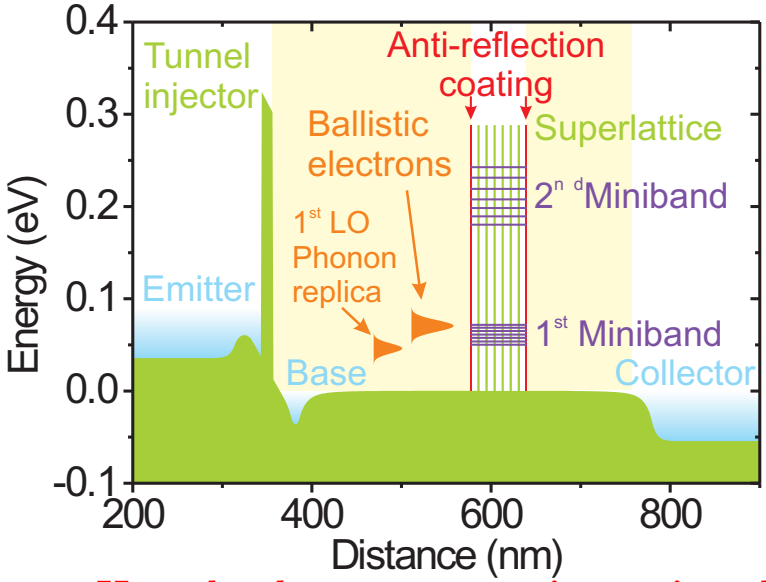
Solid State Theory FYST25/FFF051



C. Pacher, C. Rauch, G. Strasser, E. Gornik, F. Elsholz, A. Wacker, G. Kießlich, and E. Schöll: *Antireflection coating for miniband transport and Fabry-Pérot resonances in GaAs/AlGaAs superlattices*, Applied Physics Letters **79**, 1486 (2001)

How do electrons move in semiconductor heterostructures?

Why do metals reflect light so well?

How can I treat more than one particle in quantum mechanics?

Why are some materials ferromagnetic?

Aim of the course The course shall provide a better understanding of central concepts in solid state physics and their relation to the basic theories of quantum mechanics and electrodynamics. The students shall learn how these concepts can be applied to model physical effects quantitatively. Particular emphasis is given towards topics relevant to ongoing research in solid state physics and nanoscience in Lund.

The course is intended for 4^{th} year students as well as PhD students.

Content (7.5 HP)

- Brief review on the band structure of crystals and semiconductor heterostructures
- Electron transport and scattering processes
- Magnetism
- Occupation number representation, density matrix formalism, and optical Bloch equations for semiconductor lasers
- Dielectric properties, Coulomb interaction, and excitons
- Superconductivity

Expected Pre-Knowledge: Basic knowledge of solid state physics such as FYSA31 or FFF100; good knowledge of quantum mechanics, preferably FYSN17 or FMFN01; basic knowledge in statistical physics and electrodynamics.

Schedule VT2 (March-May)

Homepage `www.teorfys.lu.se/FYS234/`

Responsible teacher Andreas Wacker, Division for Mathematical Physics