

## GaAs-based bipolar cascade lasers with deep quantum well tunnel junctions

Arkadiy Lyakh and Peter Zory

Edge-emitting, GaAs-based diode lasers were fabricated with two active regions (two-stages) separated by a quantum-well tunnel junction (QWTJ). The QWTJ was comprised of a thin, high indium content InGaAs layer sandwiched between heavily-doped, p-type and n-type GaAs layers grown by MOCVD. Comparison of current-voltage characteristics for these two-stage devices with single-stage devices showed that the reverse-biased QWTJ has negligible resistivity during laser operation. As a consequence, current spreading perpendicular to the laser length in the plane of the layers (lateral direction) is reduced leading to a low threshold current for the second stage. In addition, the differential quantum efficiency of the two-stage lasers is nearly twice that of single-stage lasers. In the talk, a one-dimensional, current spreading model will be described which agrees well with the experimental data.