Lithographical fabrication of HgTe quantum well structures — Christoph Brüne, Markus König, Steffen Wiedmann, Andreas Roth, Hartmut Burmann, and Laurens W. Molenkamp — Physikalisches Institut, Lehrstuhl für Experimentelle Physik 3, Universität Würzburg, Am Hubland, 97074 Würzburg, Germany

HgTe/HgCdTe quantum well (QW) structures became very interesting for electronic applications due to the good electrical properties and the unique band structure (which e.g. enabled the observation of the quantum spin hall effect [1]). In low density n-type QWs and as a consequence of the narrow bandgap it becomes possible to deplete the conduction band completely and introduce p-type conduction. The depletion can be realised by using a gate electrode to lower the fermi level in the QW. The n-to-p transition is observed in magnetotransport measurements on hallbar structures. Clear SHF oscillations and hall plateaus are observed in the p-type regime even though the contact regions are n-type, which leads to an additional p-n junction resistance. This Esaki-type tunnel resistance is deduced from the measurements. It turned out that the resistance and mobility changes are mainly due to a change of the effective band mass of the carriers.


HL 7.1 Mon 11:30 EW 201
Gate induced transition from n to p conduction in HgTe quantum wells — Christoph Brüne, Markus König, Steffen Wiedmann, Andreas Roth, Hartmut Burmann, and Laurens W. Molenkamp — Physikalisches Institut, Lehrstuhl für Experimentelle Physik 3, Universität Würzburg, Am Hubland, 97074 Würzburg, Germany

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HL 7.5 Mon 12:30 EW 201
Radiation induced coupling of semimagnetic quantum dots — Thomas Schmidt1, Fabian Sieberer2, Lukas Worschech1, Alfred Forchel1, Taras Sobolevsky2, and Laurens W. Molenkamp2 — Technische Physik, Universität Würzburg, Am Hubland, 97074 Würzburg, Germany — Experimentelle Physik III, Universität Würzburg, Am Hubland, 97074 Würzburg, Germany

In 1954 R. H. Dicke pointed out that the particles of a spontaneously radiating gas can not be regarded as independent as long as they interact with a common radiation field [1]. Here we present optical studies performed with CdMnSe quantum dots (QDs), which indicates that due to Mn not only the nonradiative decay because of the internal Mn transition is altered but also the radiative decay undergoes a change associated with a Mn enhanced coupling of quantum dots by their radiation field [2]. The range of such a radiative coupling is in the order of the emission wavelength. By analyzing the photoluminescence intensity and the decay rate of quantum dots for differently sized mesas, it was observed that the quantum yield is larger for quantum dots embedded in large mesas with many quantum dots. Removing QDs slows down the PL decay associated with a cooperative radiation of the QDs. Interestingly, by comparison of different excitation conditions it was found that incorporation of Mn into the samples enhances the far-field coupling.


HL 7.6 Mon 12:45 EW 201
Interface phonons in CdSe/ZnSe core/shell-nanorods — Holger Lange1, Marco Machon1, Mikhail Artemyev1, Ulrike Woggon1, and Christian Thomsen1 — Fachbereich Physik, Universität Dortmund — Institute for Physico-Chemical Problems of Belarusian State University, Minsk

We discuss surface optical phonon modes and interface optical phonons in plain CdSe nanorods of different sizes and CdSe nanorods with an epitaxial grown ZnSe shell. The related Raman bands are not only influenced by the geometry of the nanorod, but also by the presence and structure of the shell.