Transport of charge carriers in the quantum wells which contain nanostructures of different shapes.

Supervisor: Prof. dr hab. Igor Tralle, Katedra Fizyki Teoretycznej, Wydział Matematyczno-Przyrodniczy, Uniwersytet Rzeszowski.

Applicant: mgr Klaudiusz Majchrowski, Katedra Fizyki Teoretycznej, Wydział Matematyczno-Przyrodniczy, Uniwersytet Rzeszowski.

The first part of the thesis is devoted to study the effect of anisotropy of photoconductivity in asymmetrical potentials (triangular and semi-parabolic) placed in an external magnetic field. The results show that the effect may be measurable in the magnetic fields about few Tesla.

In the second part an approach to 'smart' design of nanostructures containing single and double quantum wells was proposed. On the basis of the Inverse Scattering Problem (ISP) method, the computer program was elaborated in the MatLab environment, which enables to reconstruct the QW potential based on the preset energy spectrum. Potential shape reconstructed in this way can be substituted then by some approximation, so that the output spectrum obtained by solving the Schröodinger equation with such approximated potential, differs only slightly from the input one

The ISP technique was used in order to develop the tunable THz detector. The construction of the device is based on the adjustment of the energy distances between the quantum levels in such a way, that the detection of THz radiation becomes possible (2.5 and 3.0 THz). Using the formalism of non-equilibrium Green's function the characteristics of the detector was obtained: the dark current density versus electric field applied to the structure, the electron density, the photo-current response for the biased structure versus photon

energy, etc.