Abstract

This bachelor thesis addresses the high-frequency characterization of indium phosphide (InP) based double heterojunction bipolar transistors (DHBT). Two selected DHBTs with different emitter scalings (1x5 µm² and 2x15 µm²) are characterized and compared based on their high-frequency behavior. For this purpose, scattering parameter measurements are conducted under small-signal operation. The cutoff frequencies f_T and f_{max} are extracted from the measurements. Subsequently, the determination of the extrinsic small-signal equivalent circuit elements, such as contact resistances, lead inductances, and pad capacitances, is performed. This is followed by the extraction of selected intrinsic equivalent circuit elements, including the base-collector capacitances C_{ex} and C_{bc}, the intrinsic base resistance R_{b2}, the differential emitter resistance R_{be}, and finally, the base current gain α_0. To ensure an efficient and robust measurement process, two different Python programs are implemented. The first program automates the DC control of a source-measurement unit, while the latter program performs data analysis of the DHBTs and offers functions that simplify high-frequency characterization.