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Performance prediction of a future SiGe HBT technology using a heterogeneous set of simulation tools and approaches

By Tommy Rosenbaum

Books On Demand Mrz 2017, 2017. Taschenbuch. Condition: Neu. Neuware - Bipolar complementary metal-oxide-semiconductor (BiCMOS) processes can be considered as the most general solution for RF products, as they combine the mature manufacturing tools of CMOS with the speed and drive capabilities of silicon-germanium (SiGe) heterojunction bipolar transistors (HBTs). HBTs in turn are major contenders for partially filling the terahertz gap, which describes the range in which the frequencies generated by transistors and lasers do not overlap (approximately 0.3 THz to 30 THz). To evaluate the capabilities of such future devices, a reliable prediction methodology is desirable. Using a heterogeneous set of simulation tools and approaches allows to achieve this goal successively and is beneficial for troubleshooting. Various scientific fields are combined, such as technology computer-aided design (TCAD), compact modeling and parameter extraction. To create a foundation for the simulation environment and to ensure reproducibility, the used material models of the hydrodynamic and drift-diffusion approaches are introduced in the beginning of this thesis. The physical models are mainly based on literature data of Monte Carlo (MC) or deterministic simulations of the Boltzmann transport equation (BTE). However, the TCAD deck must be calibrated on measurement data too for a reliable performance prediction...



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