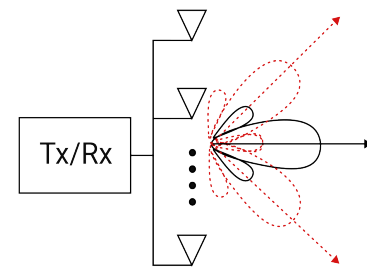


Master-Thesis

Analysis and design of a J-band vector modulator phase shifters for lens integrated beam steering in a 130nm SiGe BiCMOS technology

In the past decade, there has been rapid development in the fifth-generation (5G) communication technology, standards, and commercialization efforts leading to the shift in focus to the sixth-generation (6G) technology for ultra-high data-rate wireless links which requires new frequency allocation at higher band of the electromagnetic spectrum. Due to limited SNR and output power at frequencies beyond 100 GHz, the only way to achieve high data rates is by the design of high bandwidth (BW) systems, making the D-band (110-170 GHz) and J-band (220-325 GHz) very attractive for such applications. Data rates can be further enhanced by the use of a MIMO system with a phased array with beam steering capability. Although phased arrays and beam steering have been well established at 28 GHz (5G communication) and 77 GHz (automotive), there haven't been any commercial breakthroughs in the J-band, especially for lens-integrated systems.



Block diagram of a simplified phased array system with beam steering capability © IHCT

In this thesis, an extensive literature survey needs to be done to be aware of the state-of-the-art specifications for the vector modulator (VM) phase shifters (PS). Detailed circuit analysis of VM PS based on Gilbert cell topology needs to be performed to identify the key figure of merits (FoM) such as relative phase states, phase, and gain imbalance. Further, the circuit needs to be fully EM-simulated using a 3-D EM solver such as HFSS and optimized for the best performance.

Requirements:

- Basic understanding and design knowledge of EM structures
- Circuits theory
- CAD software such as Cadence and HFSS
- Good English knowledge

Nach Abschluss der Arbeit bestehen gute Berufsaussichten in den folgenden Bereichen:

- Wireless communication
- Chip design

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