

DESIGN OF PASSIVE SIW COMPONENTS FOR MICROWAVE AND MILLIMETERWAVE APPLICATIONS

Abstract (within 2048 words)

This thesis is being presented with this motivation, which explores various passive devices and transitions that would cater to the concept of Substrate Integrated Circuits (SIC) along with multi-band and multi-way capabilities for 5G and satellite communications and beyond communication applications. The thesis focuses on Substrate Integrated Waveguides (SIW) one of the most popular and effective SICs. Various configurations of compact multiway SIW passive devices are explored in order to achieve either broadband or dual band or improved isolation characteristics. Transition capabilities of the SIW transitions with various planar and non-planar guides are investigated. **Chapter 2** is a review on the SIW since the time it was first proposed in 1998. Based on the earlier works, SIW have been studied and analyzed. The evolution of SIW into various applications from its initial developmental phase is also discussed. Transitions of the fields of an SIW to other various planar and non-planar guides are also appraised. Special emphasis on the power division applications of an SIW is investigated as well along with their advantages and disadvantages. **Chapter 3** addresses the fundamental principles of SIW theory and analyzes the design of a functional SIW that operates effectively within circuits. In addition, the research involves an exploration of various transitions between SIW and alternative technologies. These methodologies hold significance within the context of SIC technology, paving the way for enhanced integration and performance. **Chapter 4** provides a space-efficient three-way power divider using SIW technology, operating in the X-band frequency range. It's worth noting that this specific SIW three-way power divider design is distinct in that it demonstrates non-adjacent port isolation, which sets it apart from other six-port couplers. **Chapter 5** presents a study on compact multi-way power dividers using SIW technology. The designs mentioned are intended to serve both broadband and dual-band applications. **Chapter 6** furnishes a comprehensive summary of all the preceding chapters. It also paves way into the future evolutions of SIW applications and its integration with other technologies.