

Design, Fabrication & Characterization of a Coplanar Waveguide for LiNbO₃ RF Modulators

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Abstract

The integration of high-speed electro-optic modulators in modern photonic systems demands efficient radio-frequency (RF) signal transmission structures with low loss and accurate impedance matching.

In this work, a coplanar waveguide (CPW) structure suitable for Lithium Niobate (LiNbO₃)-based RF modulators has been designed, fabricated, and characterized. The CPW geometry was optimized using ANSYS HFSS simulations to achieve a characteristic impedance of 50 Ω and minimal insertion loss over the desired frequency range. Fabrication involved e-beam evaporation of a seed layer followed by copper electroplating to obtain the desired thickness. The Photolithography process is used for the mask formation of CPW using which further samples were fabricated. The deposited films were characterized to evaluate surface morphology, thickness uniformity, and electrical conductivity.

The fabricated CPW was then tested to compare its measured RF performance with simulated results. The study demonstrates the feasibility of producing low-loss, well-matched CPW structures on LiNbO₃ substrates, providing a promising route for efficient and scalable integration of LiNbO₃ electro-optic modulators in high-frequency photonic applications.

