Investigation and Optimization of Travelling Wave Electrodes in Mach-Zehnder Modulators

**Background:**
Optical communication provides high bandwidths to deal with today’s demand of increasing data rates. It is still part of the research to improve the usage of these entire bandwidths. One limiting factor is the modulation of light with Mach-Zehnder modulators (MZM), which are not able to cover the provided frequency ranges. In an MZM based on the plasma dispersion effect the light is modulated in a pn-junction by applying a radio frequency signal on travelling wave electrodes. Usual bandwidths of this kind of MZM are valued around 10 GHz. Designing an MZM mostly leads to a trade-off between modulation intensity of the light and maximum electrical bandwidth of the electrodes, while the size of the modulator has to be considered.

**Task:**
The main part of this thesis is to investigate different topologies of travelling wave electrodes. The coplanar waveguide (CPW) is commonly used, but the coplanar strip line (CPS) could improve bandwidth and modulation intensity keeping the length of the MZM fixed. The design and calculation of new travelling wave electrode topologies shall take place in MATLAB. The results shall then be verified by 3D simulations in CST. In the end, a comparison between all investigated topologies shall be created.

The thesis may be prepared in English or German.

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