# Abstracts

## Technique for Velocity-Matched Traveling-Wave Electrooptic Modulator in AlGaAs/GaAs

*M.N. Khan, A. Gopinath, J.P.G. Bristow and J.P. Donnelly. "Technique for Velocity-Matched Traveling-Wave Electrooptic Modulator in AlGaAs/GaAs." 1993 Transactions on Microwave Theory and Techniques 41.2 (Feb. 1993 [T-MTT]): 244-249.*

A new design for a velocity-matched traveling-wave directional-coupler intensity modulator in AIGaAs/GaAs is proposed. The proposed structure utilizes a thin coating of Ta/sub 2/O/sub 5/ (which has a high dielectric constant at microwave frequencies and a low refractive index at optical frequencies) on the top of the modulator/electrode structure in order to achieve velocity matching between the optical wave and microwave signal. The addition of the Ta/sub 2/O/sub 5/ film does not significantly affect the optical properties or voltage requirements of the modulator since the coating is thin (/spl ap/ 1000Å) and the refractive index at optical frequencies is low compared to that of AIGaAs/GaAs. The optical and RF characteristics of the proposed modulator are analyzed using the effective index and the finite difference methods. The optical bandwidth is calculated numerically taking into account both the anticipated velocity mismatches due to fabrication tolerances and the calculated frequency-depenent microwave losses. The predicted small-signal bandwidth, primarily limited by microwave losses, of a 3-mm-long direction coupler biased at a null point is greater than 45 GHz, and exceeds 100 GHz (~ 50 GHz electrical bandwidth) when biased in the linear region. This device is designed to operate at 830 nm with a maximum modulation voltage (full on/off modulation at low frequencies) of 5 V. The figure of merit of the proposed device is therefore at least 10 GHz/V when the electrical bandwidth of 50 GHz is used.

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