Factors Affecting Carrier Transport in Ultra-fast III-V Compound Semiconductor-based Photodiodes

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Abstract

This dissertation describes a comparative study conducted on GaAs MSM photodetectors to assess the importance of surface effects on the optical and frequency response characteristics of MSM photodetectors. MSM photodetectors on III-V compound semiconductors are technologically important because of their applications to fiber optic communication systems. While surface effects have been previously ignored, they must be considered in assessing the ultimate performance limits of such devices, especially if nanoscale MSM photodetectors are to be used. A controlled study was carried out in which high quality devices were subjected to surface damage over a known range and the resultant effects of optical and high frequency performance were observed and correlated with the damage.