Silicon FinFETs as Terahertz and Sub-Terahertz Detectors

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Abstract

Within the last decade, interest in the terahertz portion of the electromagnetic spectrum has increased substantially, with many applications proposed for imaging and material identification. The ability to integrate terahertz detectors into CMOS devices has recently become of great interest. Until recently, the responsivity of silicon based detectors has been limited to the order of 1 V/W [26]. Thus finding devices that can be integrated into a typical CMOS chip would be a significant finding.

In our research, we study a relatively new device, the silicon FinFET, and find responsivities on the order of hundreds to thousands of volts per watt while achieving a quite competitive Noise Equivalent Power (NEP) on the order of 200 pW/$\sqrt{Hz}$. We have also found that varying the number of fins, width of the fins, and length of the gate can greatly affect the responsivity of the device. Thus demonstrating the potential of these devices in a myriad of applications.