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Terahertz Generation Based on Gunn Oscillations in Unipolar Nanodiodes MUBARAK ALI, AIMIN SONG, University of Manchester — A pressing concern in the terahertz (THz) deployment of technology is the lack of efficient, compact, solid-state THz emitters. Recently, self-switching devices (SSDs) have been demonstrated to offer a 2D planar technology with ultra-low parasitic capacitance, which enabled detection of microwave radiation up to 2.5 THz.Furthermore, it is possible to integrate a large array of SSDs in parallel in order to reduce overall impedance and hence reduce thermal noise. Monte Carlo simulations showed that the SSD can also emit radiation based on Gunn oscillations. In this work, we modeled using Silvaco Atlas to provide evidence of dipole domain formation in the channel and systematically study the dependence of emission frequency and intensity as a function of channel length and width as well as interface-charge density. The results showed that the fundamental oscillation frequency can reach as high as 400 GHz, whereas higher harmonics go well beyond 1.2 THz. By constructing an array that contains different geometries of SSDs placed in parallel, we expect to achieve frequency tuning in wide or narrow bands, which may have useful implications to practical applications.

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