Terahertz Systems-on-Chip Based on Nanotechnologies

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Abstract

The infamous “Terahertz Gap” represents frequency spectrum that ranges from 0.3 to 3THz (or 300 to 3000GHz). It lies between traditional microwave and infrared domains but remains “untouchable” via either electronic or photonic means. The conventional “transit-time-limited” electronic devices can hardly operate even at its lowest frequency; the “band-gap-limited” photonic devices on the other hand can only operate beyond its highest frequency. Since wavelengths range from 1000 to 100 μm, Terahertz signals tend to behave quasi-optically and are potentially instrumental for a wide range of scientific and industrial applications. Those include high-data rate, short distance and secured wireless & wireline communications, telemetric and remote sensing based on high-resolution radar, spectrometer and imagers for intelligent traffic/landing control, safety/security screening and bio-medical/food/drug sensing, and analysis and controls. In this talk, we will discuss fundamental & technical challenges involved in building Terahertz systems and progress made recently at UCLA and NCTU to overcome electronic/photonic barriers for realizing highly integrated (sub)-mm-Wave and Terahertz systems.