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Graphene field-effect transistors for RF applicatoins[1]

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There has been growing interest in graphene as a replacement for III-V materials in MMIC applications because of its high mobility, its potential for high saturation velocity, and its nearly perfect two-dimensional electrostatics. We present results from the first experimental high-frequency measurements of graphene field-effect transistors (GFETs), demonstrating an f_T of 14.7 GHz for a 0.5-μm-length device with a 30-nm-thick HfO_2 top-gate. Despite I_{on}/I_{off} $\sim$7, high transconductances (>833 μS/μm) and current saturation are achieved. We present detailed measurement and analysis of velocity saturation in GFETs, demonstrating the potential for velocities approaching 10^8cm/sec and the effect of an ambipolar channel on current-voltage characteristics. We find that the saturation velocity is sheet-carrier dependent and limited by interfacial phonon scattering from the SiO_2 substrate upon which the graphene is fabricated.

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