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Graphene-Boron Nitride Heterostructure Based Electro-Optical Modulator YUANDA GAO, Columbia University, REN-JYE SHIUE, Massachusetts Institute of Technology, XUETAO GAN, JAMES HONE, Columbia University, DIRK ENGLUND, Massachusetts Institute of Technology — Graphene, a two-dimensional atomic-scale carbon based material, exhibits uniform absorption of the incident light over a broad spectrum range from visible to mid-infrared. This absorption can be tuned by electrostatic doping, resulting in electro-absorptive modulation of the incident light. We propose and demonstrate a high-speed electro-optical modulator structure by using a high-mobility dual-layer graphene capacitor integrated with a planar silicon photonic crystal nanocavity. Strongly enhanced light-matter interaction of graphene in a sub-micron meter cavity enables efficient electrical tuning of the cavity reflection. We achieved a modulation depth of 3.2 dB within a voltage swing of only 2.5 V; we measured a 3dB cut-off frequency up to 1.2 GHz.

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