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Dynamic Control of Thermal Emission with Plasmonically Active Graphene Metasurfaces VICTOR BRAR, MICHELLE SHERROTT, Caltech, MIN JANG, Seoul National University, SEYOON KIM, LAURA KIM, JOSUE LOPEZ, Caltech, MANSOO CHOI, Seoul National University, LUKE SWEATLOCK, Northrop Grumman Aerospace Systems, HARRY ATWATER, Caltech —
Thermal emission is typically viewed to be broadband, unpolarized and isotropic, with a spectral profile and intensity that depend on the emissivity of the material, and that vary only with changes in temperature. In this talk we demonstrate that the intensity, polarization and spectrum of thermal emission at constant temperature can be dynamically controlled through electrostatic gating of plasmonic graphene resonators on a heated SiNx substrate. We show that the plasmonic resonances in graphene act as antenna that to out-couple the thermal energy of substrate phonons and graphene electrons to create narrow, mid-infrared spectral features in the thermal emission profile. By varying the gate voltage and resonator width, we show that these features can be effectively turned on and off at kHz rates, and tuned across a broad frequency range. Our measurements show that at 7um the emissivity of the surface can be varied by 0.02, and that the emitted radiation is polarized, with a modulated power density of 0.02W/m2 over 100cm-1 of bandwidth.

Victor Brar
Caltech

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