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GRAPHENE PLASMONICS SHIN MOU, DON ABEYSINGHE, Air Force Research Laboratory, Materials Manufacturing Directorate, Wright-Patterson AFB, OH, USA, NIMA NADER, JOSHUA HENDRICKSON, JUSTIN CLEARY, Air Force Research Laboratory, Sensors Directorate, Wright-Patterson AFB, OH, USA, SAID ELHAMRI, Department of Physics, University of Dayton, Dayton, OH, USA — Plasmon, the collective free charge carrier oscillation, has been a popular research theme recently mostly associated with surface plasmon in metal nanoparticles. After the discovery of graphene, researchers soon began to study plasmonic effects with or within graphene, for instance, decorating graphene with metal nanoparticles to enhance optical processes via plasmonic field enhancement. Following that, people also gained interests in studying the intrinsic plasmon of graphene. Graphene, a tunable semimetal under field effect, demonstrates tunable plasmon resonances at room temperature, which enables new capabilities beyond those of metal-nanoparticle surface plasmons. In this project, we would like to show intrinsic graphene plasmon resonances in that we experimentally demonstrated polarization dependent and gate-bias tunable plasmon-resonance absorption in the mid-infrared regime of 5-14 um by utilizing an array of graphene nanoribbon resonators. By scaling nanoribbon width and charge densities, we probed graphene plasmons with plasmon resonance energy as high as 0.26 meV (2100 cm^{-1}) for 40 nm wide nanoresonators. The result reveals the intriguing nature of graphene plasmon in graphene nanoribbons where the nanoribbon edge plays critical roles by introducing extra doping and damping the graphene plasmon resonance.

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