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Dynamically tunable graphene/dielectric photonic crystal transmission lines IAN WILLIAMSON, S. HOSSEIN MOUSAVI, ZHENG WANG, Univ of Texas, Austin — It is well known that graphene supports plasmonic modes with high field confinement and lower losses when compared to conventional metals. Additionally, graphene features a highly tunable conductivity through which the plasmon dispersion can be modulated. Over the years these qualities have inspired a wide range of applications for graphene in the THz and infrared regimes. In this presentation we theoretically demonstrate a graphene parallel plate waveguide (PPWG) that sandwiches a 2D photonic crystal slab. The marriage of these two geometries offers a large two dimensional band gap that can be dynamically tuned over a very broad bandwidth. Our device operates in the low-THz band where the graphene PPWG supports a quasi-TEM mode with a relatively flat attenuation. Unlike conventional photonic crystal slabs, the quasi-TEM nature of the graphene PPWG mode allows the slab thickness to be less than 1/10 of the photonic crystal lattice constant. These features offer up a wealth of opportunities, including tunable metamaterials with a possible platform for large band gaps in 3D structures through tiling and stacking. Additionally, the geometry provides a platform for tunable defect cavities without needing three dimensional periodicity.

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