304. Title:High speed terahertz modulation from metamaterials with embedded high electron mobility transistors

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Abstract:We present a computational and experimental study of a novel terahertz (THz) device resulting from hybridization of metamaterials with pseudomorphic high electron mobility transistors (HEMTs), fabricated in a commercial gallium arsenide (GaAs) process. Monolithic integration of transistors into each unit cell permits modulation at the metamaterial resonant frequency of 0.46 THz. Characterization is performed using a THz time-domain spectrometer (THz-TDS) and we demonstrate switching values over 30%, and THz modulation at frequencies up to 10 megahertz (MHz). Our results demonstrate the viability of incorporating metamaterials into mature semiconductor technologies and establish a new path toward achieving electrically tunable THz devices.