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Wave-current interactions in ultra-subwavelength plasmons JINGYEE CHEE, LING QIN, JUNDONG WU, DONHEE HAM, Harvard Univ — The low dimensionality of 2D conductors such as semiconductor quantum wells, graphene, and transition metal dichalcogenides, enables them to exhibit intriguing fundamental phenomena such as ultraslow plasmons. Our group has previously obtained 2D plasmons with very low phase velocities of less than $c/500$ in GaAs / AlGaAs heterostructures. These ultraslow plasmons open up new exciting vistas for solid-state terahertz technology by enabling ultra-subwavelength light manipulation and strong light-matter interaction. In fact, our group has developed a broad variety of ultra-subwavelength 2D plasmonic circuits at GHz-THz frequencies, which include plasmonic bandgap crystals and interferometers. This poster presentation will first review this prior work and subsequently describe our on-going effort to observe and exploit the wave-current interaction of these plasmonic waves to form irreciprocal transmission lines. We directly measure this irreciprocity in a HEMT structure using a network analyzer, and found the phase delay difference between the forward and backward waves to be greater than 0.10° per um at 50 GHz. We will also describe our attempts to measure amplification associated with the irreciprocity.

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