Abstract Submitted
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Experimental Demonstration of Epsilon-Near-Zero Perfect Absorber in Ultra-Thin Films[1] CATHERINE ARNDT, ALEKSEI ANOPCHENKO, LONG TAO, HO WAI HOWARD LEE[2], Department of Physics, Baylor University, Waco, TX 76798 — There is a significant interest in the development of ultra-thin optical absorbers, which may lead to the potential of layered broadband absorbers. Ultra-thin (<100 nm) Indium Tin Oxide (ITO) layers support certain radiative and bound p-polarized plasmonic modes at epsilon-near-zero (ENZ) frequencies. Excitation of the radiative Berremen mode leads to perfect absorption in the near-IR spectrum. By utilizing these properties, we demonstrate perfect absorption (>99%) in <15nm thick films. ITO nanolayers are deposited by RF sputtering at elevated temperatures to control their electron concentration and ENZ frequency on top of a thick gold layer. A super continuum laser (600-1700 nm) excites the Berreman mode of the ultra-thin ITO layer. The specular reflection from the sample is collected, revealing >99% absorption in the near-IR spectrum. We also demonstrate that perfect absorption of single layer ultra-thin films could be layered to create a broadband absorber. Layers of ITO with varying ENZ wavelengths are deposited on top of a thick gold layer. The perfect absorption in ultra-thin layers confirms the possibility of a multi-layered broadband perfect absorber.

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