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Near-field study of the perfect lens at visible wavelengths PIETER KIK, GRADY WEBB-WOOD, School of Optics/CREOL/FPCE, University of Central Florida — It has been predicted that thin metal films can be used to generate images with a spatial resolution better than the diffraction limit via the local excitation of surface plasmons [1]. Such near-field focusing could have applications in optical data storage and nanofabrication. We present near-field scanning optical microscopy (NSOM) experiments that clearly demonstrate frequency dependent focusing using a near-field lens. The 'perfect lens' is fabricated by depositing a 50nm thick gold layer onto a 50nm thick silicon nitride membrane. Focusing is detected by monitoring the interference between light emitted from a nanoscale object (the aperture of an NSOM tip) and radiation scattered by Pt nanoparticles placed in the image plane behind the lens. NSOM scans performed at wavelengths in the range 468nm-676nm reveal the role of surface plasmons in the imaging process. The measured frequency dependent image resolution is compared with numerical simulations based on the Finite Integration Technique. [1] J. B. Pendry, Phys. Rev. Lett. 85, 3966 (2001)

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