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Single atom lensing ERIK STREED, ANDREAS JECHOW, BENJAMIN NORTON, SYLVI HAENDEL, VALDIS BLUMS, DAVID KIELPINSKI, Griffith University — The lens is a fundamental optical device for redirecting the path of light. We have observed the first lensing of light by a single atom. A $^{174}Yb^{+}$ ion is confined in a 3D RF Paul trap, laser cooled near the Doppler limit on the λ=369.5 nm transition, and imaged at wavelength scale resolution with a large aperture phase Fresnel lens (NA=0.64). Changes to the wavefront of the illumination light are measured from background-subtracted images at different image defocusings and laser detunings. The wavefront was observed to converge for negative laser detunings (positive focal lengths), diverge for positive detunings (negative focal lengths), and agrees with an analytic microscope model of a dipole radiator. The effective focal length of the atom is on the order of lambda near resonance.

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