Phase-Coherent Measurement of Particle Distributions in Electron Acoustic Waves.\textsuperscript{1} C.F. DRISCOLL, F. ANDEREGG, R.B. LYNCH, UCSD — Phase-coherent velocity distribution functions $f(v_z)$ are measured by Laser Induced Fluorescence, for standing “electron acoustic” waves in pure ion plasmas. These (mis-named) waves are the lower-frequency branch of standard electrostatic plasma waves, with phase velocity $v_\phi \approx 1.3\bar{v}$. The waves are necessarily nonlinear so as to flatten the distribution at $v_\phi$, thereby voiding the otherwise strong Landau damping. Our measurements are performed on $m_\theta=0$, $m_z=1$ waves driven to moderately large amplitude, i.e. $e\delta\phi \geq 0.1T$. Received LIF photons are accumulated in 8 phase bins, according to the instantaneous received phase of the wall electric field. The phase-coherent $f(v_z)$ shows 1) particle sloshing, $\delta\langle v \rangle$, as expected; 2) phase reversal of $\delta f$ at $v=0$ and $v=v_\phi$, in general correspondence with the linear perspective of $\delta f = (\delta f_0/\partial v)/(v - v_\phi)$; and 3) plateaux around $v_\phi$ with velocity widths as expected from wave-trapping theory. Measurements will be compared to traveling wave trapping theory and to standing wave particle simulations.

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