Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Measurement of the Ion Distribution Function in a Dual Frequency Plasma Etch Tool[1] WALTER GEKELMAN, NATHANIEL MOORE, PATRICK PRIBYL, Dept of Physics, University of California Los Angeles, MARK KUSHNER, University of Michigan EECE — The ion energy distribution function, (IEDF) was measured in detail in an industrial etch tool. The plasma was made with an ICP source (440 kHz, 500 W) and two independently controlled bias sources. The Si wafer was placed on a ceramic electrostatic chuck with an embedded capacitor plate. The first source ran at 2.2 MHz (600 Vpp and 2500 W) with a maximum sheath potential drop of 650 V or 2000V. The second source ran at 19 MHz with Vpp of 600 V. The principal diagnostic was Laser Induced Fluorescence on Argon using 611.49 nm light from a tunable dye laser with ions responding to Doppler shifted light. Using cylindrical lens combinations the laser light was transformed into a sheet 15 cm wide and 0.5 cm thick. The beam could be transverse or parallel to the normal of the wafer. The glowing ions (at 461 nm) were photographed by a CCD camera with 400 micron resolution. The laser was phase locked to the 2.2 MHz rf and the IDDF measured as a function of radial position, height above the wafer and at 8 phases. With Vpp = 600 V the highest energy ions observed were 500 eV, 1.2 mm above the wafer. These observations as well as the angular distribution agreed well with a computer simulation. In the dual frequency case when the potential of the wafer was most negative wrt the bulk plasma the IEDF structure 0.8 mm above the wafer was well fitted by 4 Gaussians. The ion flux to the wafer was far more uniform in the dual frequency case.

[1]This research supported by the NSF and DOE.

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Date submitted: 18 Jun 2015 Electronic form version 1.4