Abstract Submitted
for the GEC14 Meeting of
The American Physical Society

Ion velocity distribution function measurements in a dual-frequency rf sheath[1] NATHANIEL MOORE, WALTER GEKELMAN, PATRICK PRIBYL, UCLA Department of Physics, YITING ZHANG, MARK KUSHNER, Electrical Engineering and Computer Science, U. Michigan — Ion dynamics are investigated in a dual-frequency rf sheath above a 300 mm diameter biased silicon wafer in an industrial inductively coupled (440 kHz, 500 W) plasma etch tool. Ion velocity distribution (IVD) function measurements in the argon plasma are taken using laser induced fluorescence (LIF). Planar sheets of laser light enter the chamber both parallel and perpendicular to the surface of the wafer in order to measure both parallel and perpendicular IVDs at thousands of spatial positions. A fast (30 ns exposure) CCD camera measures the resulting fluorescence with a spatial resolution of 0.4 mm. The dual-frequency bias on the wafer is comprised of a 2 MHz low frequency (LF) bias and an adjustable 10-20 MHz high frequency (HF) bias. The bias voltages may be switched on and off (f_{rep} up to 1 kHz, duty cycle 10-90%). Several different bias and timing combinations were tested. Ion energy distribution function and ion flux measurements for each case are compared. For the LF case (no HF), the IVD was found to be uniform to within 5% across the wafer. IVDs as a function of phase of the LF bias were also measured. The LF experimental results are compared with simulations specifically designed for this particular plasma tool.

[1]Work supported by the NSF and DOE.

Nathaniel Moore
UCLA Department of Physics

Date submitted: 13 Jun 2014 Electronic form version 1.4