Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Ion velocity distribution function and electric field measurements in a dual-frequency rf sheath[1] NATHANIEL MOORE, WALTER GEKELMAN, PATRICK PRYBIL, 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 bias and an adjustable 10-20 MHz high frequency bias. The bias voltages may be switched on and off (f_{rep} up to 1 kHz, duty cycle 10-90%). IVDs are measured with several different bias and timing combinations. For the 2 MHz bias, it was found that the IVD is uniform to within 5% across the waf er. IVDs as a function of phase of the bias were also measured. The electric field in the sheath was measured volumetrically over the wafer at thousands of positions using an emissive probe. The experimental results are compared with a simulation specifically designed for this particular plasma tool.

[1]Work supported by the NSF and DOE.

Nathaniel Moore
UCLA Department of Physics

Date submitted: 03 Jul 2013

Electronic form version 1.4