

Title: In-situ laser diagnostics of plasma surface interactions by fs-TALIF

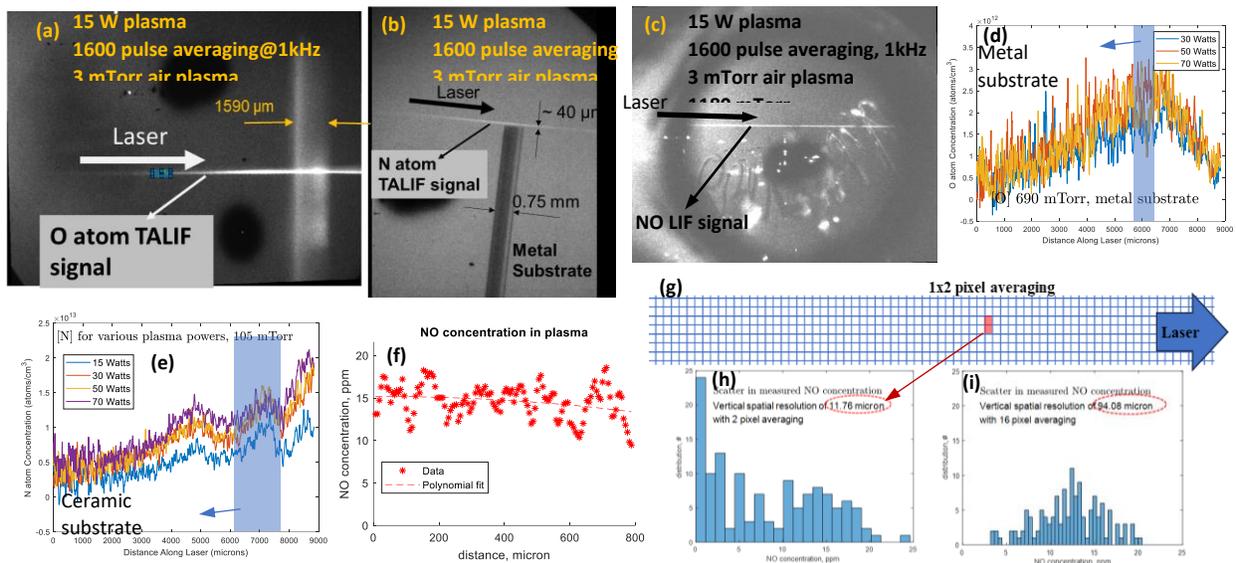


Figure 1: Sample Phase I results. (a) O atom TALIF signal with laser grazing over a *ceramic* substrate; (b) N atom TALIF signal with laser grazing over a *metal* substrate; (c) NO LIF signal with laser grazing over a heated Kanthal wire; (d) measured O atom concentrations; (e) measured N atom concentrations; (f) measured NO molecule concentrations; (g) averaging NO LIF signal over pixels to study S/N ratio vs. spatial resolution achieved; (h) scatter in measured NO concentration with 2 vertical pixel averaging and (i) 16 pixel averaging.

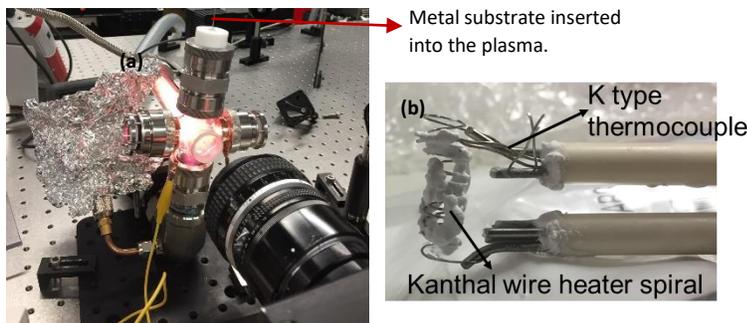


Figure 2: (a) 6-way cross plasma reactor with optical windows. A metal or ceramic substrate inserted into the plasma from top; (b) a wire heater rated up to 1200 °C was used as a substrate for temperature measurements over its surface using NO LIF.

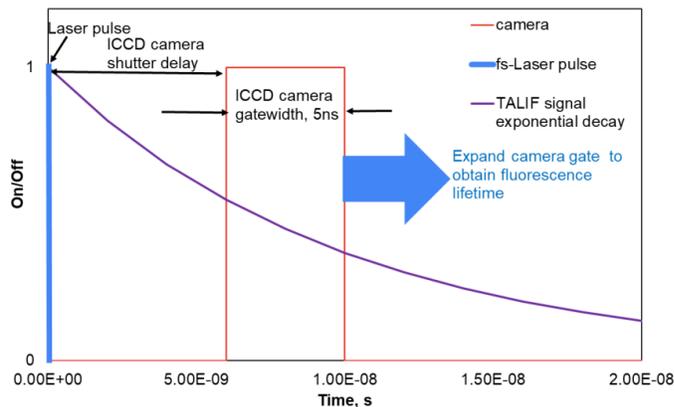


Figure 3: Schematic showing synchronization and timing of the fs-laser pulse and the camera gatewidth. The camera gate can also be expanded to collect the complete fluorescence signal over the lifetime.

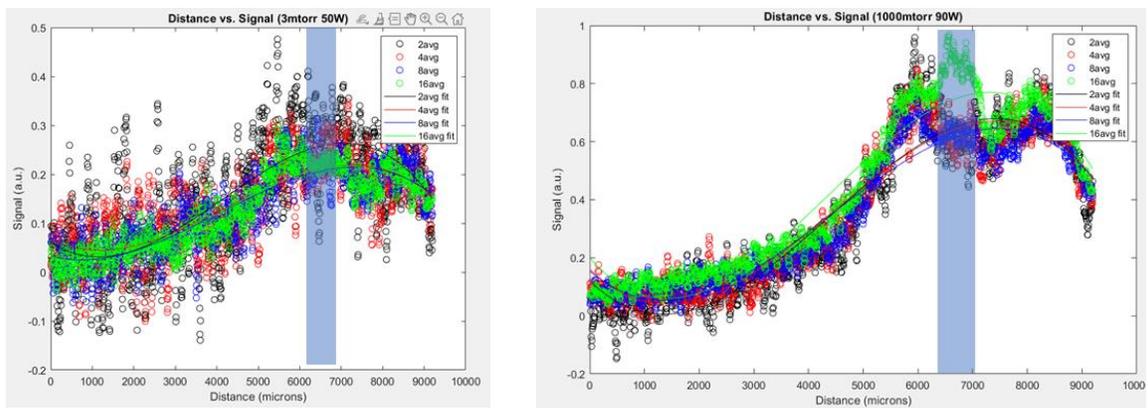


Figure 4: N atom TALIF signal for different pressures and plasma powers. (a) 3 mTorr, 50 W; (b) 1000 mTorr, 90 W. The scatter in the signal decreases with increasing pressure. The blue shaded region is the location of the metal substrate, with measurements done having laser grazing the metal substrate. The different “avg” refer to the number of laser shot averaging in multiples of 400 laser shots at 1 kHz.