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Atomic Coherence Length Spectroscopy of Pulsed Plasma YONG W. KIM, NOPPORN POOLYARAT, Lehigh University — The movement of atoms at an interface must entail sequences of atomic collisions. Such collisions reduce the coherence of atomic emissions. Since the sequence of such collisions is stochastic, we postulate that coherence lengths associated with plasma emissions from the interfacial atoms must vary in accordance with the correlated movements of the neighboring atoms of the interface. To explore the connection between atomic fluctuations and the onset of instability, we have developed an interferometer coupled to a spectrometer for measurement of the coherence length of plasma emissions at a selected wavelength. The interferometer is capable of utilizing the plasma emissions from a point in the plasma to form interference fringes, or extracting two separate beams from two adjacent but different points of the plasma to construct the interference fringes. The fringes are processed in a spectrometer so that internal excitation of plasma atoms may be examined. The fringe field is captured time resolved by using a gated intensified array detector. We show an interference-fringe field constructed from a spark-gap discharge and also from a laser produced plasma plume that is confined in a dense neutral gas. Visibility of the interference fringe field is used to determine the coherence length as a function of position within the plasma and as a function of angle the line of sight makes with a symmetry axis.

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