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Turbulence Onset as a Continuous Phase Transition in Nanoscale Plasmas[1] JOSEPH JOHNSON, EPHREM MEZONLIN, STEPHEN ROBERSON, Florida A&M University — Using a standard set of parameters, turbulent signatures are observed in a roughly 150 nanosecond duration laser–induced plasma from a 4 nanosecond Nd-Yag 450 mJ/pulse laser. Transport parameters for such plasmas show a lambda-like dependence on turbulent fluctuation energy. In this context, the spectral index is defined as a transport parameter when it is determined as the fractional change of turbulent fluctuation energy with respect to the fractional change in frequency. When we postulate a simple dependence of turbulent energy on the ion temperature, the phase space diagram at the onset of turbulence can be derived based on the pressure and temperature in the turbulent plasma along with the measured values of critical spectral index. When we use the critical characteristic fluctuation frequency as a measure of the turbulence inducing constraint, the effective turbulent force is seen to decrease, at fixed temperatures, with increasing pressure.

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