Neutron enhancement from laser interaction with a critical fluid

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We discuss neutron production from a system prepared near the liquid-gas critical point. The petawatt laser at the University of Texas-Austin was focused on a cluster gas producing a hot plasma. Using deuterated methane, it is possible to prepare the system very close to its critical temperature and pressure. We let the fluid expand through a conical nozzle and irradiate it with the laser. After the ionization, the clusters explode and the collision of two energetic ions might produce neutrons from fusion reactions. We showin Fig. 1 that the critical fluctuations present in the nozzle before the expansion

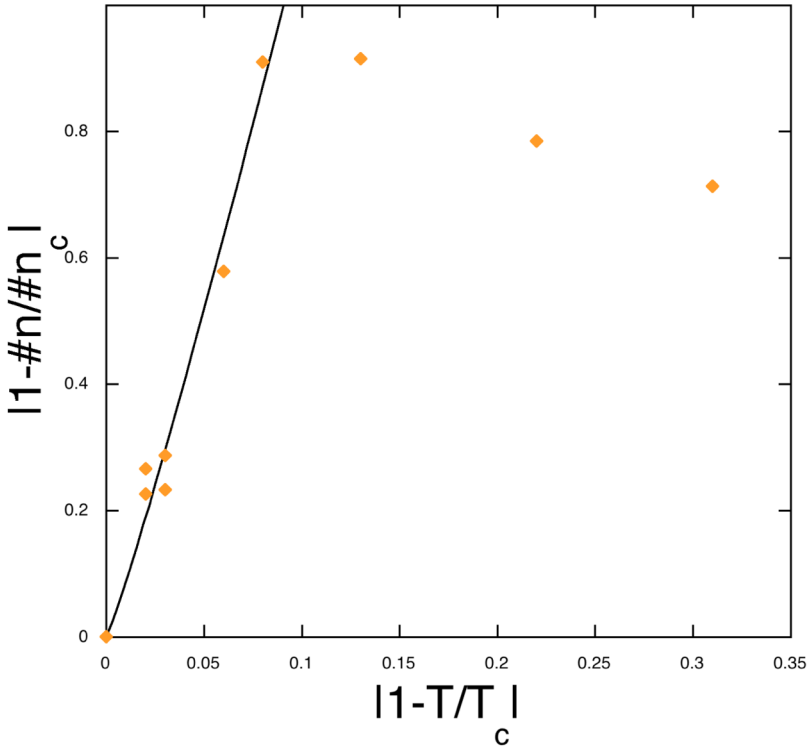

FIG. 1. "Critical distance" of the neutron number as function of the distance from the critical temperature. The power law fit (full line) gives: $|1-\#n/\#n_c|=14.1\cdot|t|^{1.1}$.

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influence the dynamics of neutron production. Neutron production near the critical point follows a power law, which is a signature of a second order phase transition and it is consistent with the Fisher model. This result might be relevant for energy production from fusion reactions.