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**Electron cavitation and dynamic channel formation in underdense plasma**[1] GEORGE PETROV, JACK DAVIS, ALEXANDER VELIKOVICH, Naval Research Laboratory — Irradiation of clusters by high-intensity lasers leads to the generation of energetic X-rays ($\sim$KeV) useful for many applications in biology, material science and plasma diagnostics. If the laser intensity is sufficiently high ($\sim 10^{17}$ W/cm$^2$) the electrons promptly leave the cluster and form an underdense plasma. Further, under favorable conditions, electron cavitaion occurs and the X-rays can propagate into the channel with minimal losses. Since the presence of the channel is critical for the X-rays propagation, we studied the channel formation in pre-formed underdense plasmas, irradiated by a high intensity laser. We found that the channel formation proceeds on a time scale of $\sim$10-100 fs, depending on the laser beam diameter. The channel typically lasts for as long as the laser pulse is on and closes shortly after the rear of the laser pulse has passed due to Coulomb attraction from the ion core. The front and the rear of the laser pulse propagate in very different environment: while the front of the pulse propagates through high-density media (unperturbed electron density), the rear of the pulse propagates essentially in vacuum. Results will be shown for Xe plasma from small Xe clusters (20 A radius), subject to ultra-high laser intensity of $10^{20}$ W/cm$^2$.

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