

Stimulated Raman Backscatter from a laser wakefield accelerator

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Experiments were performed using the HERCULES laser at the University of Michigan to produce the first experimental measurements of backward Stimulated Raman Scattering (BSRS) generated by a 30 fs laser pulse during laser wakefield acceleration. Backscattered radiation was found to be highly modulated and significantly broadened and red-shifted in cases where electrons were generated. Backward SRS broadening (increased red-shifting) was found to increase linearly with electron charge generation for laser intensities exceeding 100 TW. The red-shifted area was also increased linearly with plasma density at these powers. No such correlations were observed for laser powers at and below 50 TW. Red-shift broadening of the backward SRS spectrum may be associated with increased electron-self injection due to perturbation of the plasma bubble in a wakefield accelerator, resulting in a greater number of accelerated electrons.