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Hard x-ray source enhancement via tailored plasma interaction[1]
BRENT BLUE, PATRICK POOLE, RUSS BENJAMIN, ROBERT KIRKWOOD, SCOTT WILKS, MARK MAY, KLAUS WIDMANN, Lawrence Livermore National Laboratory — A high fluence source of hard x-rays (30+ keV) is desired for extreme radiation effects testing but currently cannot be produced via existing laser-driven K-alpha or pulsed-power bremsstrahlung capabilities. An alternative source under development enhances typically undesired laser-plasma instabilities to generate hot electrons that convert to bremsstrahlung x-ray emission in high-Z target walls. Experiments on Omega and NIF have been performed varying hohlraum plasma conditions to strengthen and enhance plasma waves, most recently using novel foams with density gradients to achieve a 4x increase in hard x-ray emission over single-density counterparts (which themselves emitted 10x greater hard x-rays than a typical target). Further results utilizing solid density structure within the hohlraum preferentially boosts emission of the desired 50-70 keV x-ray spectral range. These experimental results will be discussed along with corroborating simulations that allow extrapolation to ideal conditions on NIF.

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