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Dynamically Guided Extreme Ultraviolet Photon Acceleration Using a Structured Flying Focus PHILIP FRANKE, JOHN PALASTRO, DILLON RAMSEY, DAVID TURNBULL, TANNER SIMPSON, DUSTIN FROULA, Laboratory for Laser Energetics, U. of Rochester — Recently developed spatiotemporal pulse-shaping techniques allow the position of maximum intensity in a focused laser beam to propagate at any velocity over long distances. Ionization fronts that move at the velocity of such a "flying focus" have been demonstrated when the instantaneous intensity is above the ionization threshold of a background material. Previous simulation results have shown that photon acceleration in such an ionization front can efficiently and coherently shift the frequency of a witness laser pulse from the visible into the extreme ultraviolet (EUV, λ <100 nm) in ~1 cm of interaction length. Here we present simulations showing that shorter wavelengths can be achieved over shorter accelerator lengths. Combining multiple transverse spatial modes produces a dynamic guiding structure with steepened accelerating gradients. This eliminates refraction of the witness pulse without the need to shape the neutral density of the target and yields larger frequency shifts over the same accelerator length. Additional spatiotemporal shaping can "trajectory lock" an accelerated ionization front to the changing group velocity of the witness pulse, further increasing the frequency shift. This material is based upon work supported by the Department of Energy grant DE-SC0019135 and the Department of Energy National Nuclear Security Administration under Award Number DE-NA0003856.

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