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Subwavelength nanobrush target to collimate fast electrons ZONGQING ZHAO, Research Center of Laser Fusion, China Academy of Engineering Physics, LIHUA CAO, Institute of Applied Physics and Computaional Mathmatics, LEIFENG CAO, WEIMIN ZHOU, YUCHI WU, BIN ZHU, KEGONG DONG, BAOHAN ZHANG, YONGKUN DING, YUQIU GU, Research Center of Laser Fusion, China Academy of Engineering Physics — A subwavelength nanobrush target was proposed to collimate fast electrons in laser plasma interaction, which consists of a 5 μm copper underlay covered with a 20μm thick layer of metallic fibers. The diameter of the individual fibers is about 200 nm and the spacing between them is about 150 nm. The experiment was hold at SILEX-I laser facility (10J, 31fs, 300TW). When a subwavelength nanobrush target interacts with ultraintense laser of $7.9*10^{18}/cm^2$, highly collimated fast electron beam with divergence angle nearly zero whereas the divergence of the plane target is 40 degree. Two-dimensional particle-in-cell (PIC) simulations show that the fast electrons will be accelerated and guided by strong transient electromagnetic fields created at the wall surfaces of nanobrushs. Both experiment and simulation show that the subwavelength nanobrush target can indeed generate fast electrons more efficiency and collimate them. The scheme should be useful for fast ignition and Kα source research in inertial confinement fusion.

Zongqing Zhao
Research Center of Laser Fusion, China Academy of Engineering Physics

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