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High Repetition-Rate Neutron Generation by Several-mJ, 35 fs pulses interacting with Free-Flowing D_2O.[1] JUNGMOO HAH, University of Michigan - Ann Arbor, GEORGE PETROV, Naval Research Laboratory, JOHN NEES, ZHAOHAN HE, MARK HAMMIG, KARL KRUSHELNICK, ALEXANDER THOMAS[2], University of Michigan - Ann Arbor — Recent advance in ultra-high power laser technology allows a development of laser-based neutron sources. Here we demonstrate heavy-water based neutron source. Using several-mJ energy pulses from a high-repetition rate (kHz), ultrashort (35 fs) pulsed laser interacting with a $\sim$ 10 μm diameter stream of free-flowing heavy water (D_2O), we get a 2.45 MeV neutron flux of 10^5/s. In the intentionally generated pre-plasma, laser pulse energy is efficiently absorbed, and energetic deuterons are generated. As a convertor, the bulk heavy water stream target and the large volume of low density D_2O vapor near the target are collided with accelerated deuterons, generating neutron through d(d,n)^{3}He reactions. As laser pulse energy increased from 6mJ to 12mJ, the neutron flux increased. From the 2D particle-in-cell simulation, comparable neutron fluxes are shown at the similar laser characteristics to the experiment. Also, simulation shows forward and backward moving deuterons, which are main distributing ions impinging upon D_2O stream and vapor, respectively.

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