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Acceleration of Hydrogen Ions up to 30 MeV and Generation of 3x10^{12} Neutrons in Megaampere Deuterium Gas-Puff Z-Pinch[1] D. KLIR, J. CIKHARDT, J. KRAVARIK, P. KUBES, K. REZAC, O. SILA, Czech Technical University in Prague, A. SHISHLOV, R. CHERDIZOV, F. FURSOV, V. KOKSHENEV, B. KOVALCHUK, N. KURMAEV, A. LABETSKY, N. RATAKHIN, IHCE, RAS, Tomsk, H. ORCIKOVA, K. TUREK, Nuclear Physics Institute, AS CR, Prague — Fusion neutrons were produced with a deuterium gas-puff z-pinch on the GIT-12 generator at the Institute of High Current Electronics in Tomsk. The peak neutron yield from DD reactions reached $Y_n = (2.9 \pm 0.3) \times 10^{12}$ at 100 μg/cm linear mass density of deuterium, 700 ns implosion time and 2.7 MA current. Such a neutron yield means that the scaling law of deuterium z-pinches $Y_n \propto I^4$ was extended to 3 MA currents. The further increase of neutron yields up to $(3.7 \pm 0.4) \times 10^{12}$ was achieved by placing a deuterated polyethylene catcher onto the axis. Maximum neutron energies of 15 and 22 MeV were observed by radial and axial nToF detectors, respectively. A stack of CR-39 track detectors showed up to 40 MeV deuterons (or 30 MeV protons) on the z-pinch axis. Since the energy input into plasmas was 70 kJ, the number of DD neutrons per one joule of stored plasma energy exceeded the value of 5×10^7. This value implies that deuterium gas-puff z-pinches belong to the most efficient plasma-based sources of DD neutrons.

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