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Coherent X-Ray Emission from a Plasma Discharge-Driven Hydride Target GEORGE H. MILEY, ANDREI LIPSON, U. of Illinois, Urbana-Champaign, Urbana, IL 61801, HEINZ HORA, University of New S. Wales, Sydney, Australia — A. B. Karabut originally reported a soft x-ray laser (∼1.5 keV) using metal targets (Ti ,Pd) as the cathode in a high-current pulsed deuterium plasma discharge [1, 2]. We have undertaken experimental and theoretical studies of the emission process at the UIUC. Coherent x-ray emission is observed during discharge operation at a 0.1-0.5 T and cathode and anode spacing of 4 mm, voltage of 1-2 kV, pulsed current < 2 A. Square-shaped 0.2-2.0 ms current pulses with 0.1 us rise time give X-ray output of 13.4 mW/cm^2, dose = 3.3 μJ/cm^2, efficiency $\sim 10^{-4}$. The proposed mechanism assumes a thermal shock-induced D-diffusion process near the cathode's surface (generating high order harmonics) due to the high current deuteron bombardment. This results in penetration of recoil deuterons into the inner (LII) electron shell of the cathode material (Pd). The excitation energy is then lost as the electron returns back to its native orbital. [3, 4] Work is underway to extend studies to higher currents and voltages. [1] A. Karabut, "Solid X-ray Laser ...," Proc., 11th Intern'l. Conf. on Emerging Nuclear Energy Systems, Albuquerque, NM. 2002, pp. 374-382. [2] G . H. Miley, A. Lipson, and A. Karabut, "A New Type of Phonon-Driven X-ray Laser", Novel Accel. and Laser-Beam Interactions, ICFA-6, Oxford, UK, July, 2003. [3] P. B. Corkum, Phys. Rev. Lett, Vol. 71, 1994. [4] M. Drescher, et al., Nature, 419, 803 (2002).

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