Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Laser driven ion channel x-ray laser. C.S. LIU, National Central University, Taiwan, VIPIN TRIPATHI, Indian Institute of Technology, New Delhi — An intense short pulse laser, undergoing relativistic self-focusing in a plasma, pushes the low energy electrons radially outward to create an ion channel, while accelerates, directly by itself or by the wakefield driven plasma wave, the energetic ones axially to multi-MeV energies. When the energy spread of energetic electrons is contained, they form a beam that executes betatron oscillations in the channel and drives x-ray radiation unstable via betatron resonance, ω-kv$_z$ = ω_b, producing coherent x-rays of frequency $\omega = 2\gamma_0^2\omega_b$, with optimum growth rate $\Gamma_m \approx \omega_p \left(n_{ob}/n_o\right)^{1/3}/2\gamma_0^{5/6}$, where $k = \omega/c$, $\omega_b = \omega_p/(2\gamma_0)^{1/2}$ is the betatron frequency, ω_p is the plasma frequency, γ_0 is the Lorentz factor of the beam, v$_z$ is its axial velocity, and n_{0b}/n_0 is the ratio of beam density to plasma density. The fractional energy spread in excess of $2\,\Gamma_m/3\,\omega_b$ reduces the growth rate.

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Date submitted: 19 Jul 2005 Electronic form version 1.4