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Coherence-based Transverse Measurement of Laser-Synchrotron X-ray Radiation and Laser-Accelerated Electrons R. SHAH, F. ALBERT, K. TA PHUOC, F. BURGY, J.-P. ROUSSEAU, O. SHEVCHENKO, D. BOSCHETTO, A. ROUSSE, Laboratoire d'Optique Appliquée, ENSTA, CNRS UMR7639, Ecole Polytechnique, Chemin de la Hunière, 91761 Palaiseau, France, A. PUKHOV, S. KISELEV, Institut fur Theoretische Physik I, Heinrich-Heine-Universität, 40225 Dusseldorf, Germany — A narrow divergence (2°), broad-spectrum of keV x-rays results from the interaction of a fs intense laser pulse (I$\geq 10^{18}$ W/cm^2) with He gas[1]. The x-rays originate from transverse oscillations of laser-accelerated electrons within the plasma accelerator. We present measurement of single edge diffraction from this source at center energy 4.5 keV. Filters characterize the source spectrum. Calculation of the radiation profile based on mechanism shows that x-ray transverse dimension acts as upper limit on that of the radiating electron beam. The measured full-width-half-maximum (FWHM) x-ray source size, assuming Gaussian profile, of 5$\pm$2 μm agrees with the near Gaussian profile of electrons at the plasma exit in three-dimensional particle-in-cell simulation (FWHM=4 μm). Such measurements are fundamental to both the x-ray radiation coherence and emittance of the electron beam. Supported by EU (Contract Nos. HPRI-CT-1999-00086, HPRI-CT-2000-40016, and HPRI-CT-1999-50004 (FAMTO project)). R.S.supported by NSF (Grant No. 0502281) and CNRS.

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