

Abstract Submitted
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Measurement of beam transverse emittance via measurement of the x-ray source size in a wakefield accelerator S. KNEIP, M. BLOOM, S.P.D. MANGLES, Z. NAJMUDIN, Imperial College London, UK, C. MCGUFFEY, V. CHVYKOV, F. DOLLAR, G. KALINTCHENKO, A. MAKSIMCHUK, W. SCHUMAKER, V. YANOVSKY, A.G.R. THOMAS, K. KRUSHELNICK, University of Michigan, Ann Arbor, US, J.L. MARTINS, R. FONSECA, L.O. SILVA, IST Lisbon, Portugal, K. TA PHUOC, Ecole Polytechnique, France — We propose and use a new technique to measure the transverse emittance of a laser-wakefield accelerated beam of relativistic electrons. The technique is based on the simultaneous measurements of the electron beam divergence given by p_{\perp}/p_{\parallel} , the measured longitudinal spectrum p_{\parallel} and the transverse electron bunch size in the bubble r_{\perp} . The latter is obtained via the measurement of the source size of the x-rays emitted by the accelerating electron bunch in the bubble. These so-called betatron x-rays [1] have also shown to be spatially coherent and as bright as currently existing 3rd generation Synchrotrons [2]. We measure a normalized beam transverse emittance as small as 0.6π mm mrad for a monoenergetic electron beam with 400 MeV energy.

[1] A. Rousse, et. al. Phys. Rev. Lett. **93**, 135005 (2004)

[2] S. Kneip, et. al. Nature Physics, submitted (2010)

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