

Abstract Submitted  
for the DPP05 Meeting of  
The American Physical Society

**Wigner diagnostics for the photon accelerator** FREDERICO FI-  
UZA, JORGE SANTOS, JOAO DIAS, SAMUEL MARTINS, RICARDO FON-  
SECA, LUIS SILVA, GoLP/CFP, Instituto Superior Tecnico, Lisbon, Portugal  
— The wake driven by a short intense laser pulse propagating in a transparent  
plasma can be used to up-shift or downshift another ultrashort electromagnetic  
pulse co-propagating with the wake (the photon accelerator). Photon accelera-  
tion/deceleration can be a powerful diagnostic for the structure of the wake, and it  
provides a mechanism to tune the frequency of short laser pulses. We have performed  
detailed fully relativistic one-dimensional, two-dimensional, and three- dimensional  
particle-in-cell simulations with osiris 2.0 of the photon accelerator, over a wide  
range of realistic laboratory conditions for the neutral gas background, the plasma  
background, the wake field driver, and the probe. Our study relies on the systematic  
use of the Wigner transform for the electromagnetic field, thus allowing for a com-  
plete diagnostic of the frequency modulations in the probe pulse. We demonstrate  
controlled tunability of the probe pulse, as well as the detailed control of the laser  
chirp.

Luis Silva  
GoLP/CFP, Instituto Superior Tecnico, Lisbon, Portugal

Date submitted: 20 Jul 2005

Electronic form version 1.4