

# A SINGLE-SHOT METHOD FOR MEASURING FEMTOSECOND BUNCH LENGTH IN LINAC-BASED FREE-ELECTRON LASERS

Z. Huang, K.L.F. Bane, Y.T. Ding, P. Emma, SLAC, Menlo Park, California, USA

## *Abstract*

There is a growing interest in the generation and characterization of femtosecond and sub-femtosecond pulses from linac-based free-electron lasers (FELs). In this paper we study a simple longitudinal transformation for measuring a very short electron bunch. We show that this method can be applied in a straightforward manner at x-ray FEL facilities such as the Linac Coherent Light Source by slightly adjusting the second bunch compressor followed by running the bunch on an rf zero-crossing phase of the final linac. After taking into account the linac wakefield, we find the condition under which the final beam energy spread corresponds directly to the compressed bunch length. When used in conjunction with a high-resolution electron spectrometer, this method potentially reveals temporal information of femtosecond and sub-femtosecond electron bunches used by such FELs.

**CONTRIBUTION NOT  
RECEIVED**