

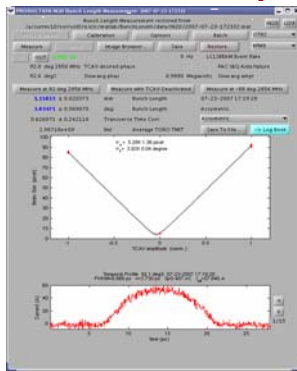
BUNCH LENGTH MEASUREMENT IN MATLAB

M. Zelazny, S. Allison, S. Chevtsov, P. Emma, K. D. Kotturi, H. Loos, S. Peng, D. Rogind, T. Strauman

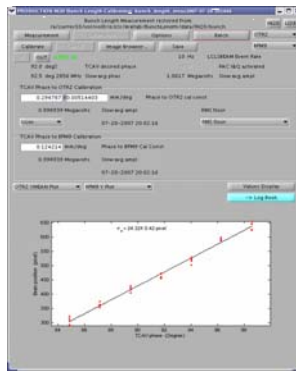
ABSTRACT:

This destructive measurement uses a transverse mounted RF deflector (TCAV) to vertically streak the electron beam and an image taken of an insertable screen with a camera. The device control was implemented using the EPICS toolkit. The analysis software was implemented in Matlab using labCA. This architecture allows engineers and physicists to develop and integrate their control and analysis without duplication of effort.

Matlab Graphical User Interface using GUIDE



Measurement



Calibration



Options

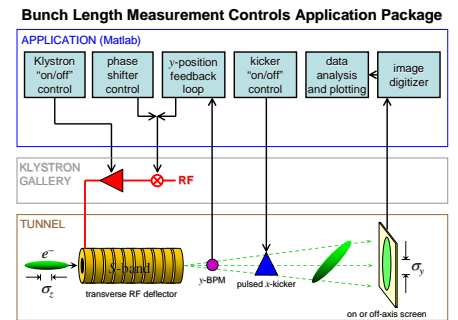


Image Analysis

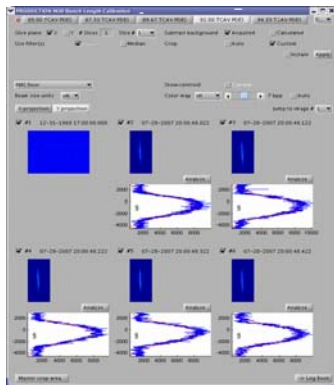
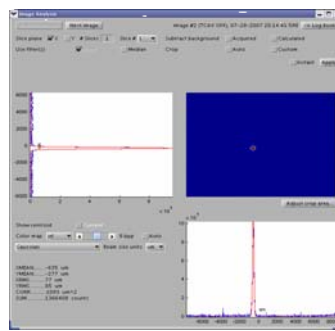
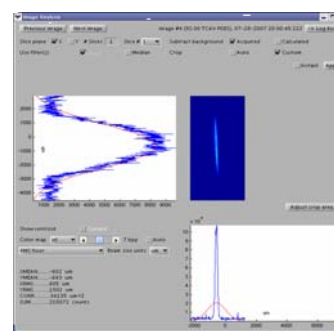


Image Browser



TCAV Deactivated



TCAV Activated

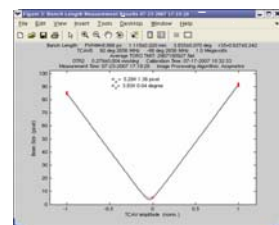
To Measure the bunch length you must first determine the distance the beam is deflected, in the y plane, by the transverse mounted RF accelerating structure (Calibration) by reading BPM y position and camera images.

Two TCAV phase zero-crossings, where the BPMS y position reads 0.0 mm, are determined using the calculated calibration constants. They should be 180 degrees apart.

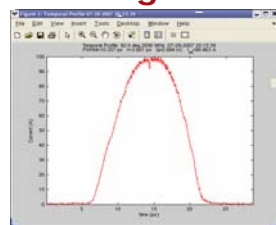
The bunch length is calculated using beam profile images taken at these two TCAV phase settings and with the TCAV deactivated (Measurement).

A temporal profile can also be calculated to compare to the requested injector laser pulse length.

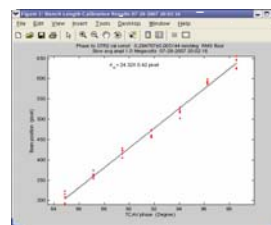
Automatic Log Book Entries



The Bunch Length



Temporal Profile



Calibration