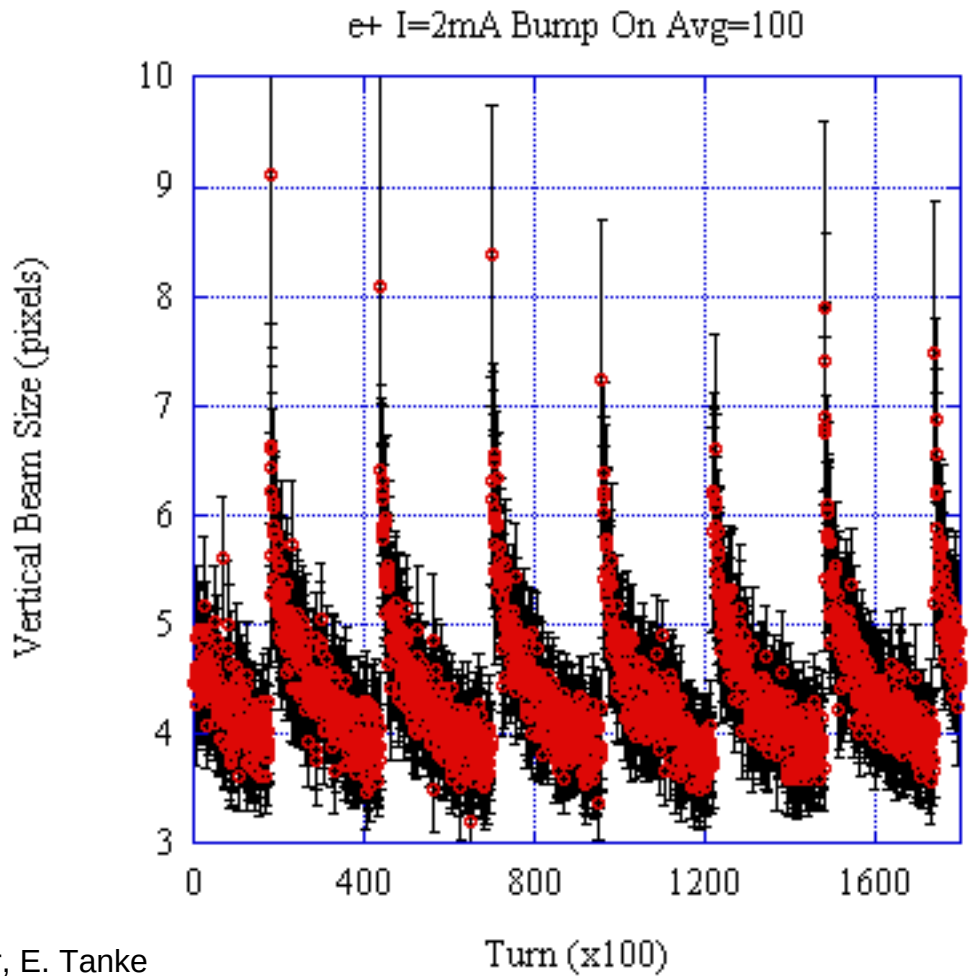
e+ Vertical Damping Time

Used pulsed beam bumpers, operating at 15Hz, for beam excitation and damping time measurement.

PMT measured σ_v for 180K turns with 100 turn average.

Beam excitation occurs every ~26K turns.

Data taken on 4/24/2006.

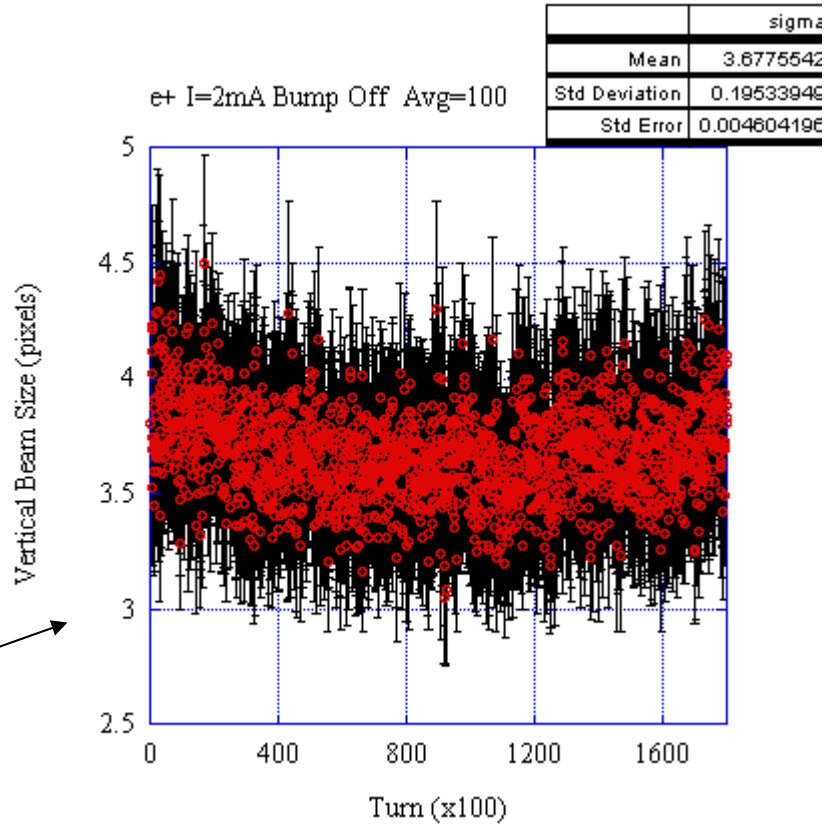


R. Holtzapple, M. Billing, G. Codner, J. Kern, M. Palmer, E. Tanke

The equilibrium beam size, σ_{eq}, was measured separately. After each excitation σ was χ^2 fit to the following curve with the equilibrium bunch length held constant.

$$\sigma^2(t) = \left(\sigma_{inj}^2 - \sigma_{eq}^2\right) e^{-\frac{2t}{\tau}} + \sigma_{eq}^2$$

Measured vertical damping time at I=0.2, 0.5, 1, and 2mA.



Equilibrium bunch length at I=2mA is σ_{eq}=3.678+/-0.005 pixels. The damping time is highly dependent on the equilibrium bunch length!

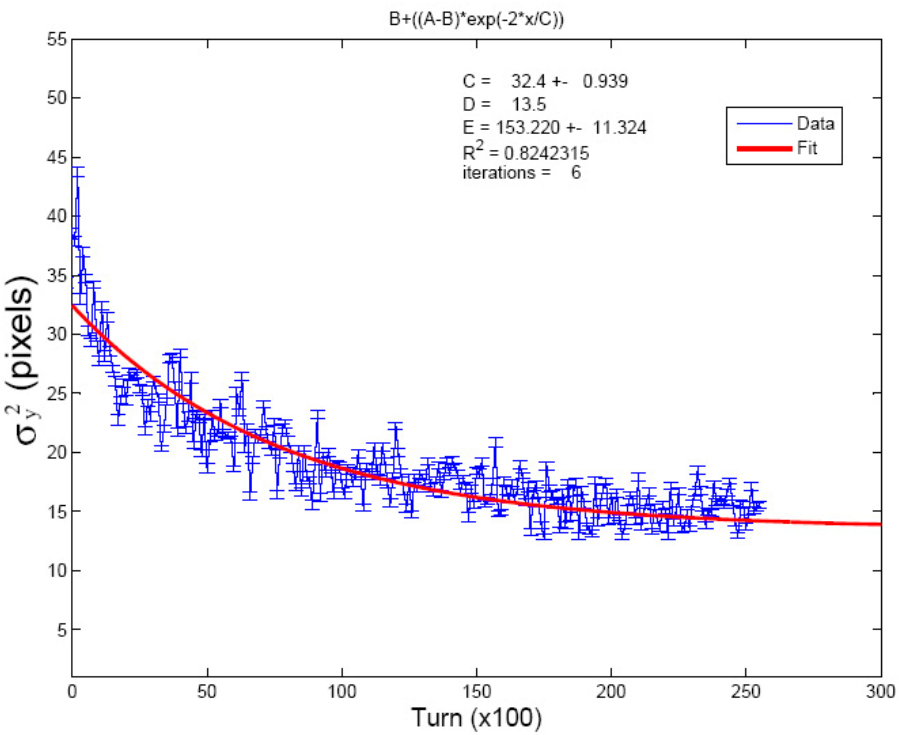
Results

I (mA)	τ_y (ms)
2	36.8 ± 2.3
1	47.8 ± 9.0
0.5	32.6 ± 4.2
0.2	54.4 ± 11.1
0.2	39.0 ± 9.8

Equilibrium bunch length was measured twice at I=0.2mA

σ_{eq}=3.6 pixels

σ_{eq}=4.1 pixels



Summary

- Using the PMT to measure the pulsed bump excitation is a viable method to measure the vertical damping time.
- From this data set there is no apparent current dependence on damping time.
- The equilibrium bunch length is crucial for the measurement. It would be beneficial to reduce the excitation period to achieve the equilibrium bunch length.