

# Streak Camera Activities at S7

B.W. Adams

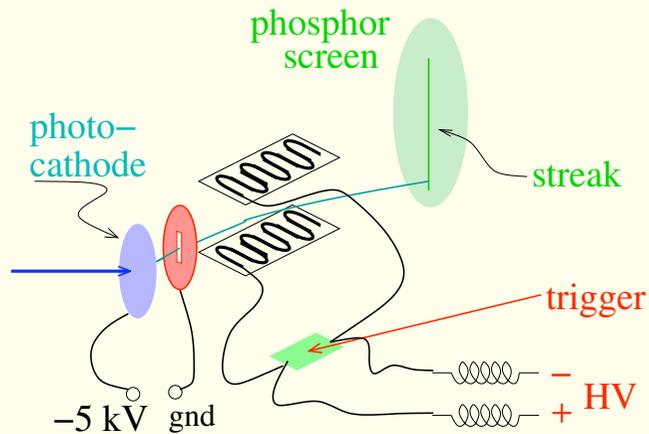
September 2006

# Overview

- What is a streak camera
- Michigan camera
- APS camera
- Streak camera in 7-ID-C
- future plans

# What is a streak camera

rapid deflection of an electron beam by a ramped electric field  
electrons generated at photocathode,  
ramp triggered electrically or with a laser

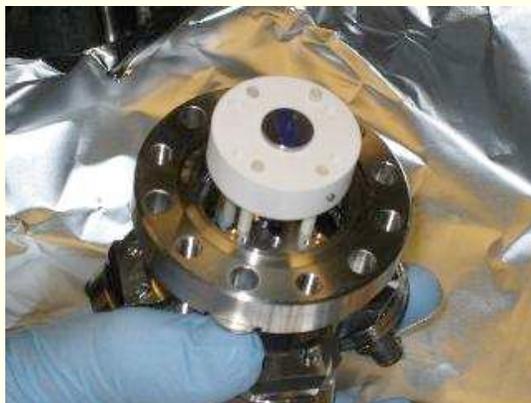
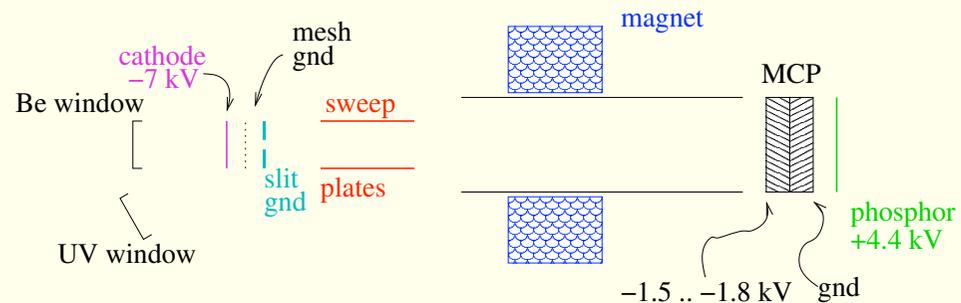


meanders on sweep plate  
for matching excitation  
to electron velocity



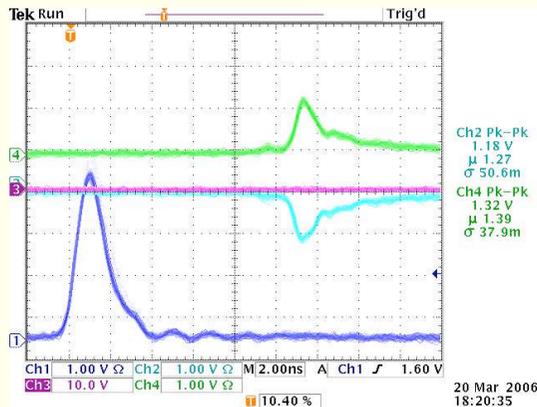


# Michigan camera

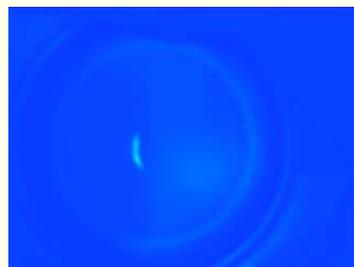


# Michigan camera, streaking

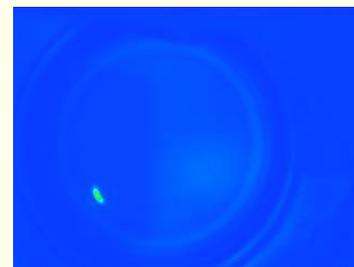
static deflection at 250 mA in focusing magnet:



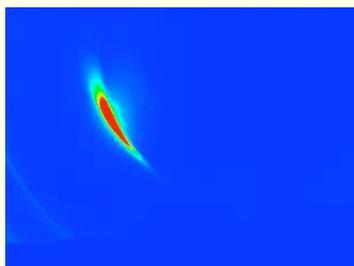
photodiode, output of sweep plates



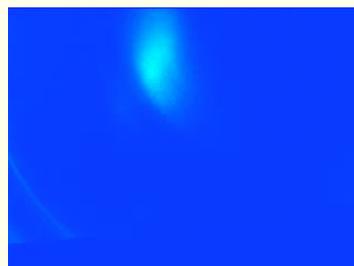
0 V



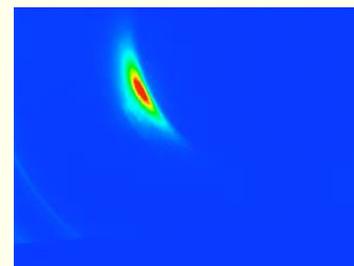
60 V



0 ns



2.0 ns



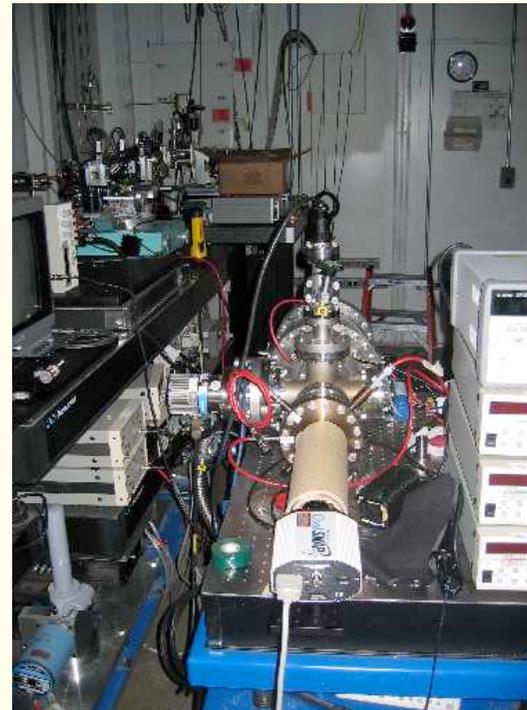
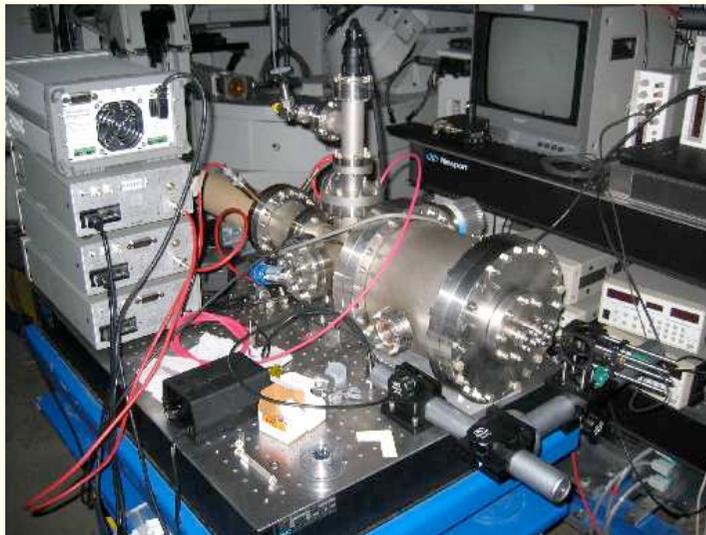
4.1 ns



## APS camera

Earlier version: Rev. Sci. Inst. **82**, 3553 (2003): 600 fs resolution (UV), e-static focusing

Current version: Tested with x-rays at 7-ID with electronic triggering, magnetic focusing



# APS camera

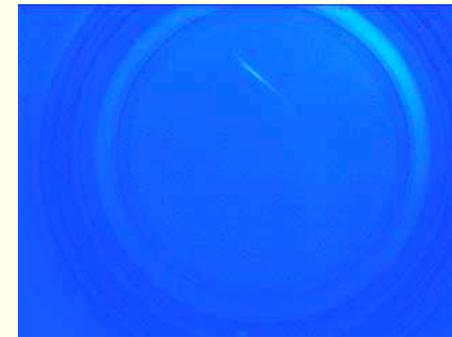
Tests of static deflection using deep-UV LED (255 nm) to illuminate photocathode



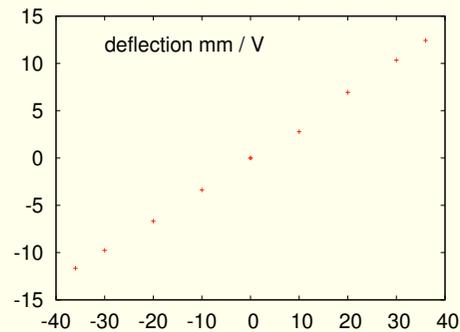
-36 V



0 V

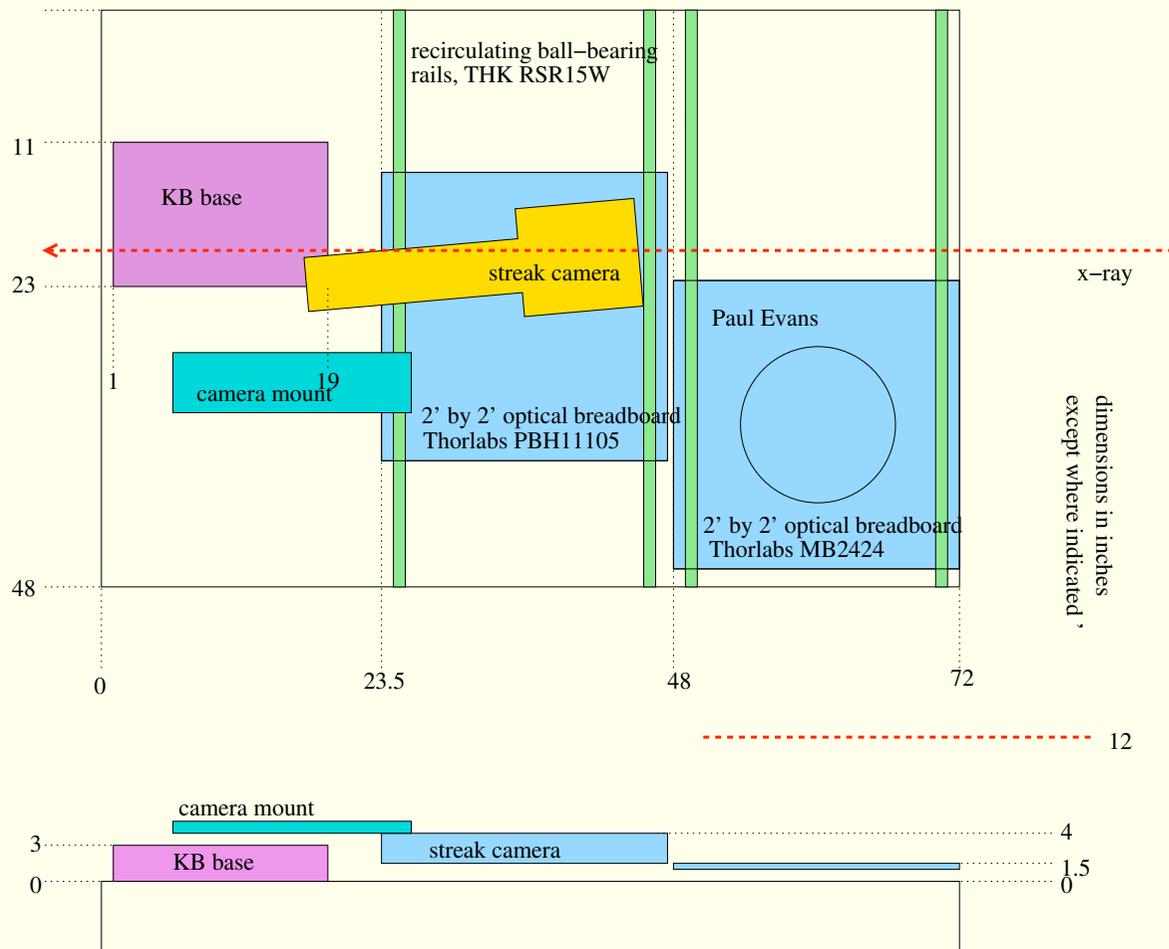


+36 V



# 7-ID-C

Semipermanent setup in 7-ID-C:



# Triggering options

photoconductive switch:

intense laser pulse generates massive amounts

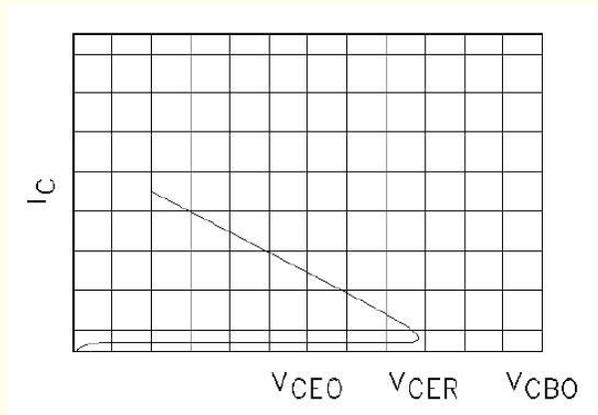
of carriers in a semiconductor (GaAs)

optically triggered avalanche transistor

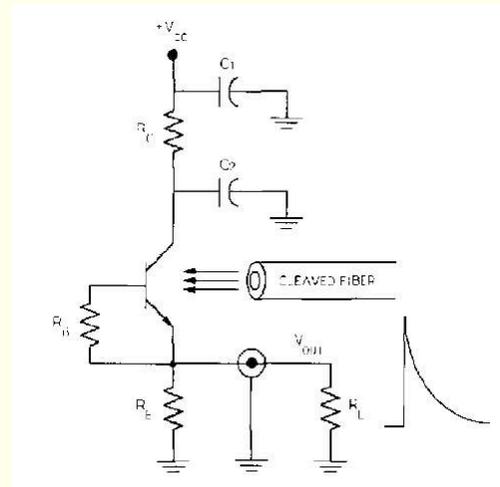
IEEE Trans. Inst. Meas. **40**, 649 (1991)

avalanche transistor, trigger from P0

requires mW inst. power ( $< 1$  nJ in ns pulse)



specialized: Zetex ZTX415,  
or general purpose 2N2222A



ideally, av. tr. on sweep plate

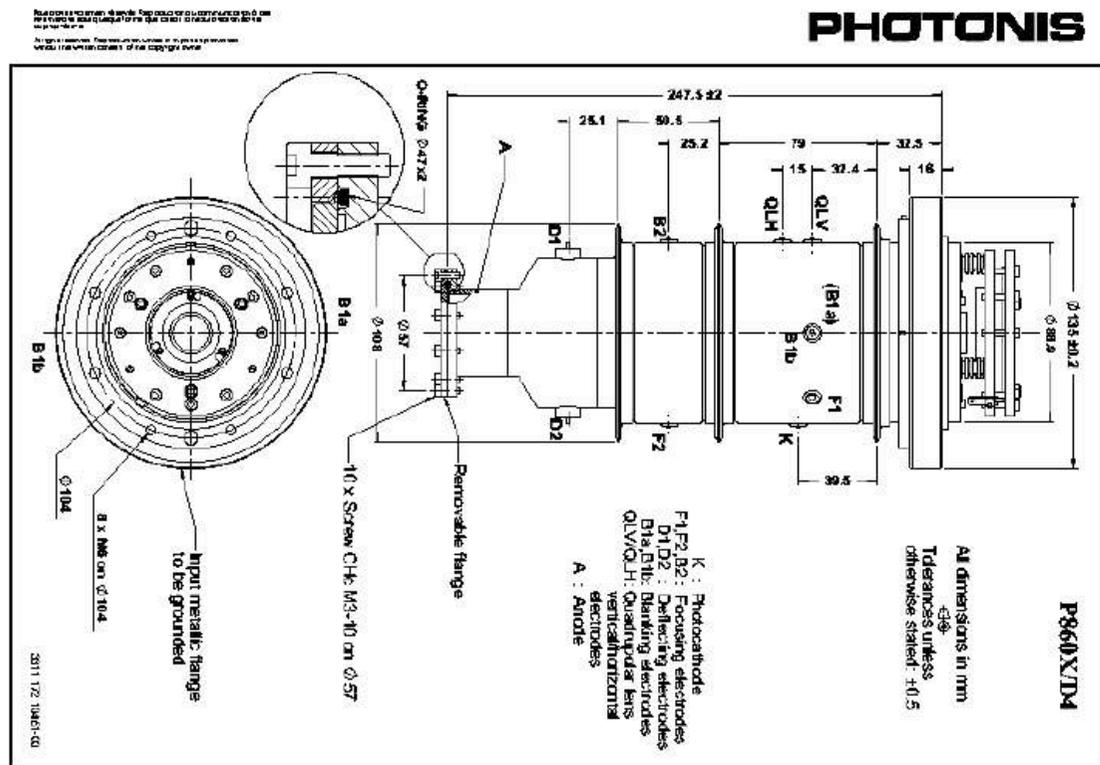
laser pulse through fiber into streak camera



# Commercial Streak Camera

Complete camera w. 700 fs resolution: Axis, Quebec, 250K

or streak tube from Photonis (45k)



## Summary & Outlook

- tested UM camera, has problems with focusing, need to redesign the magnet, or convert to electrostatic focusing, time resolution currently severely limited by bad focus
- tested APS streak camera, focuses well, very sensitive to deflection voltage, will test with x-rays, and sweep in October when beam is up again APS camera sweep was tested by Jinyuan, triggering off P0 with avalanche transistor
- will explore optical triggering with avalanche transistors on sweep plates, trigger light (nJ) from laser through fiber
- sliding optical tables in 7ID-C for accurate repeatable positioning of streak cam, Paul Evan's setup, and other stuff

