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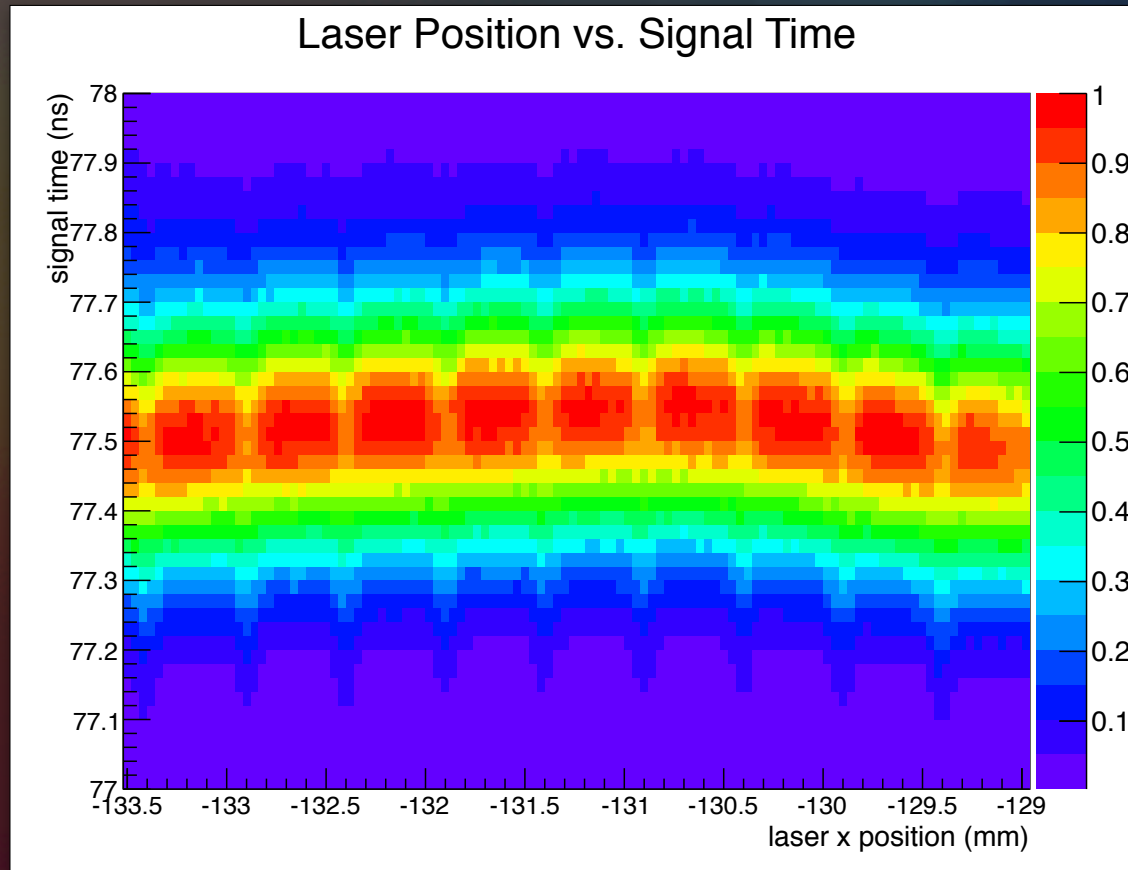
# H8500 STUDIES

# INTRODUCTION

- WE HAVE BEEN DOING SOME STUDIES OF THE H8500
- SINGLE-PHOTON LIGHT SOURCE
- LOOKING AT:
  - TIMING
  - CROSS-TALK
  - UNIFORMITY



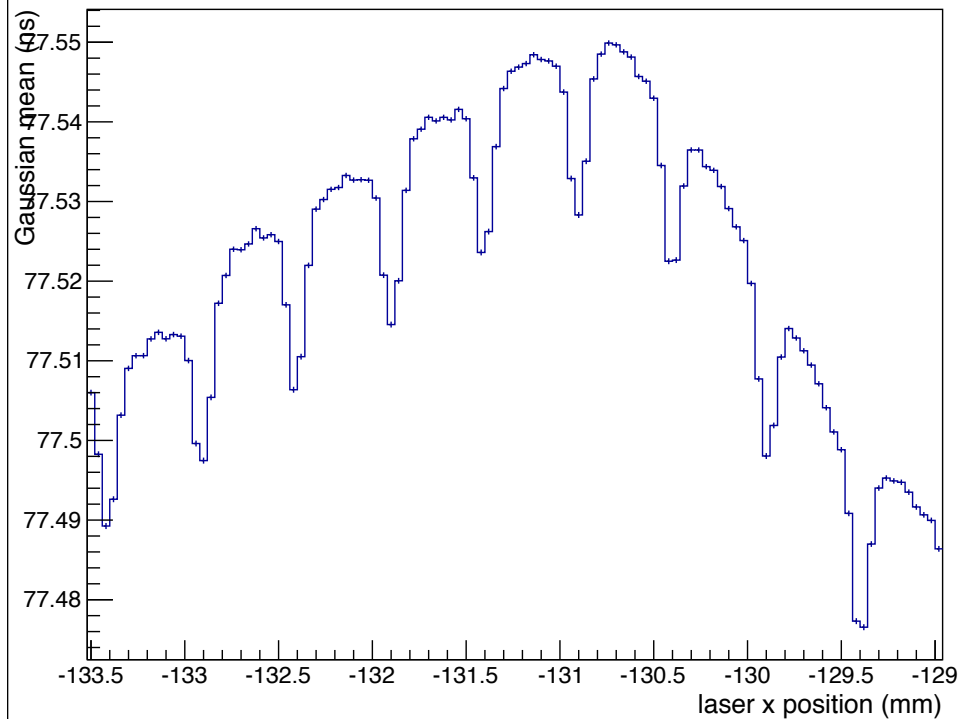
# TIMING STUDIES



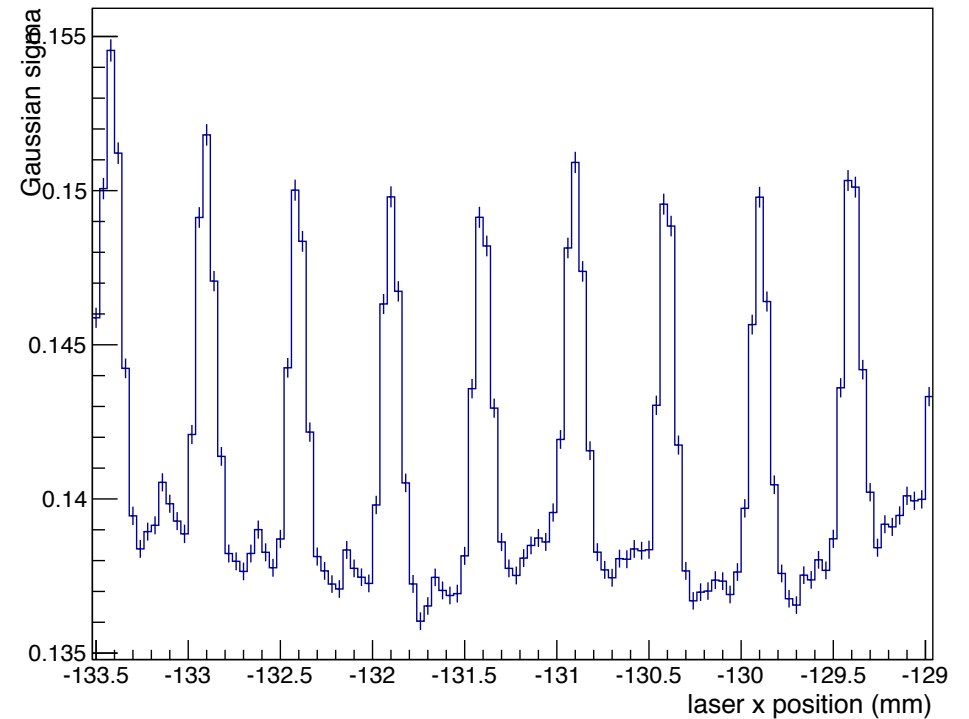
TIME VS. POSITION

I-D SCAN IN X ACROSS ~ I PAD  
STEP SIZE: 0.04 MM, 20K TRIGGER/STEP  
TRIGGER EFF ~85% (NOT SINGLE PHOTON)

Fit Gaussian Mean



Fit Gaussian Sigma



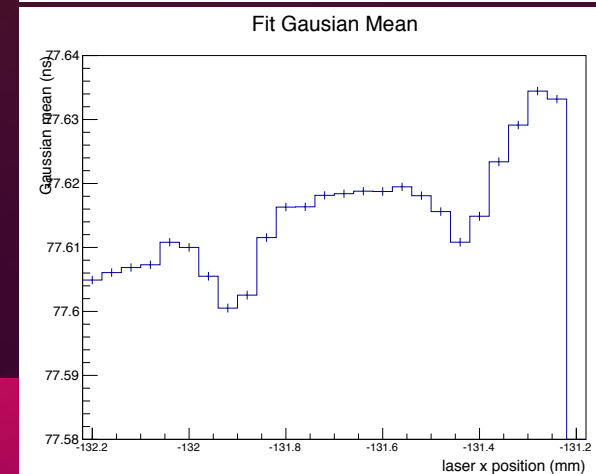
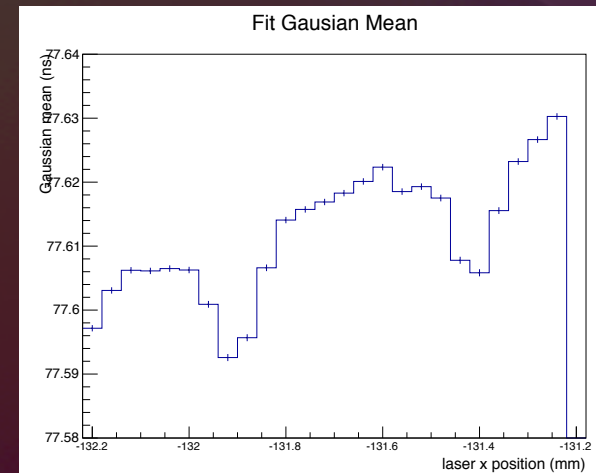
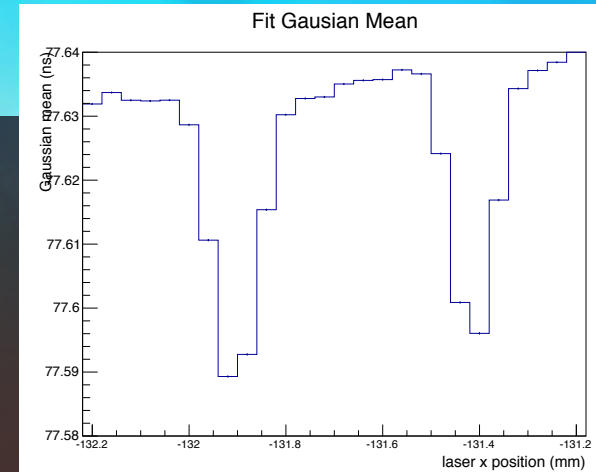
FIT GAUSSIAN TO TIME  
DISTRIBUTION AT  
EACH STEP

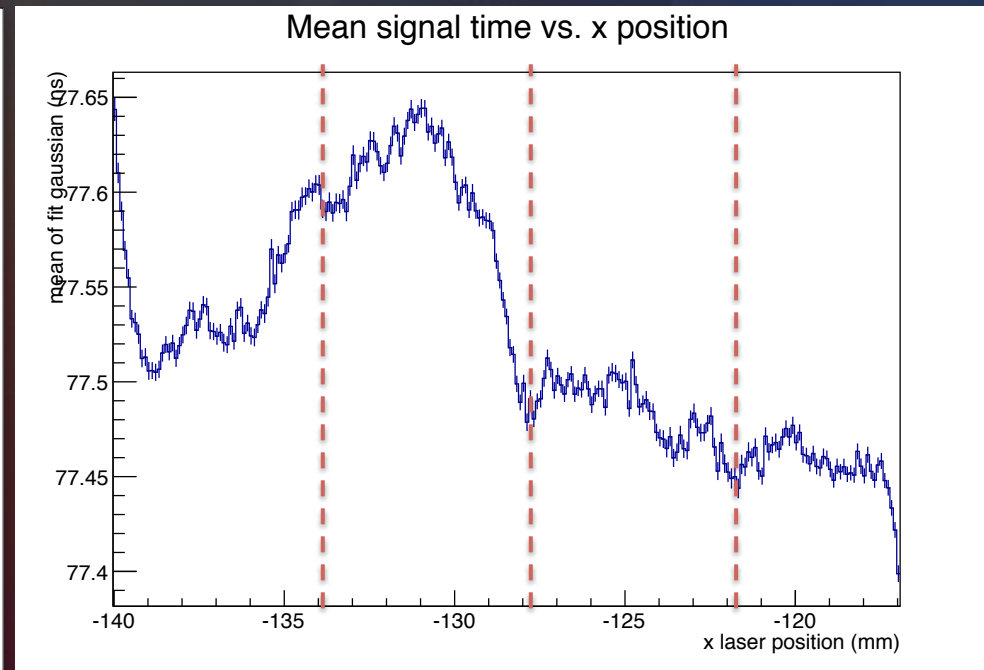
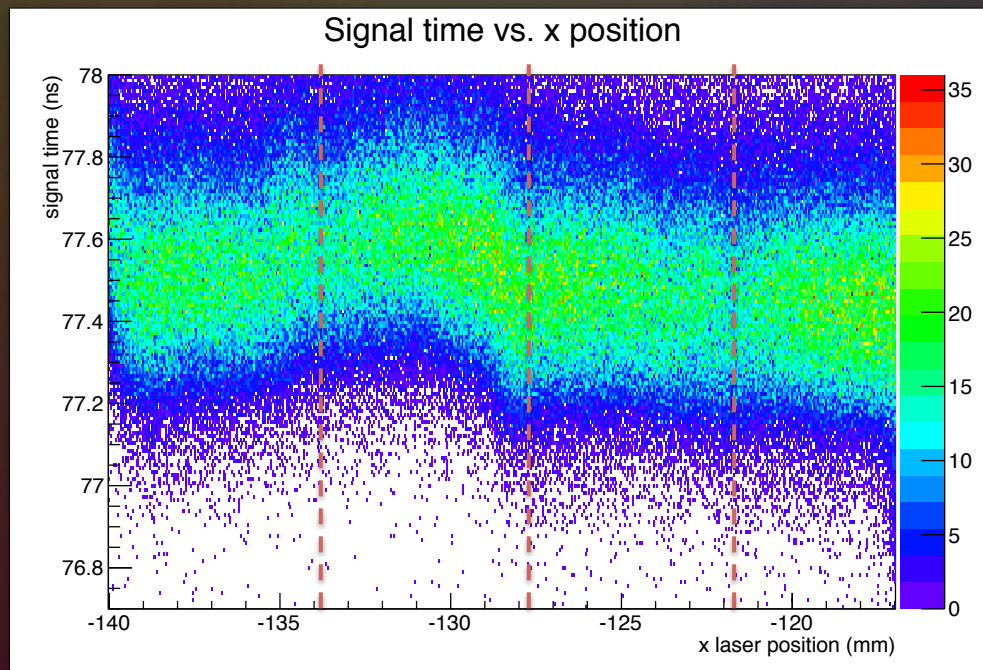
SIMILAR TO BARI RESULTS.  
BOTH MEAN AND SIGMA DEPEND ON WHERE YOU ARE IN  
THE PAD.



# SIZE OF EFFECT DEPENDS ON SIGNAL

- 1) MEAN SIGNAL PEAK  $\sim 800\text{mV}$
- 2) MEAN SIGNAL PEAK  $\sim 200\text{mV}$
- 3) MEAN SIGNAL PEAK  $\sim 120\text{mV}$





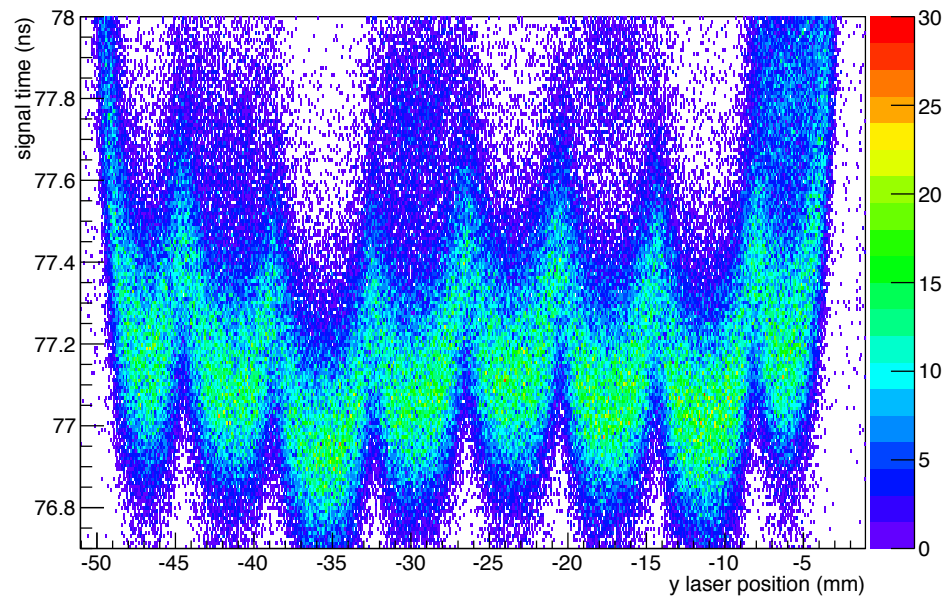
SINGLE PHOTON REGIME:  
ALMOST NO EFFECT

~ 1.5% TRIGGER EFFICIENCY (SINGLE PHOTON)

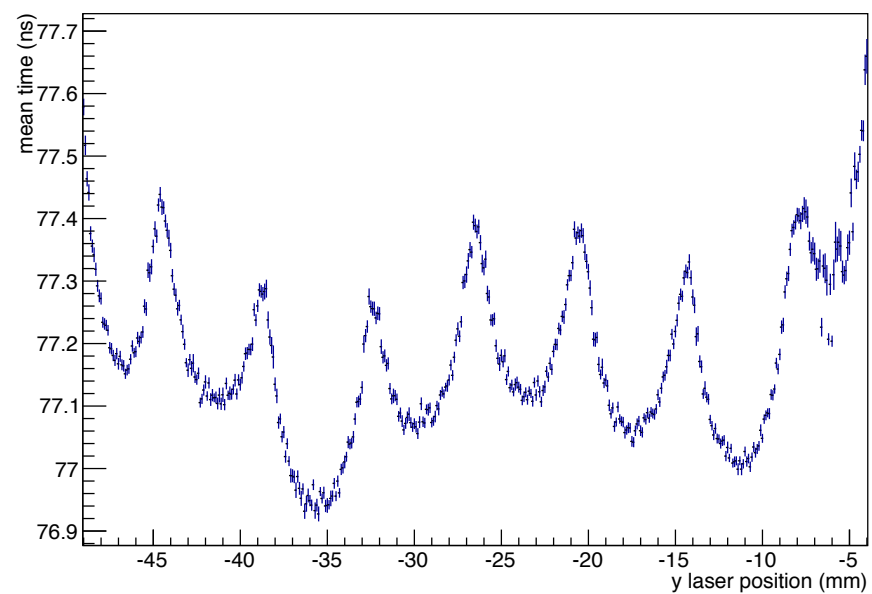
4 PADS

100K TRIGGERS PER STEP

Signal time vs. y position



Mean of fit gaussian



SCAN IN Y-DIRECTION

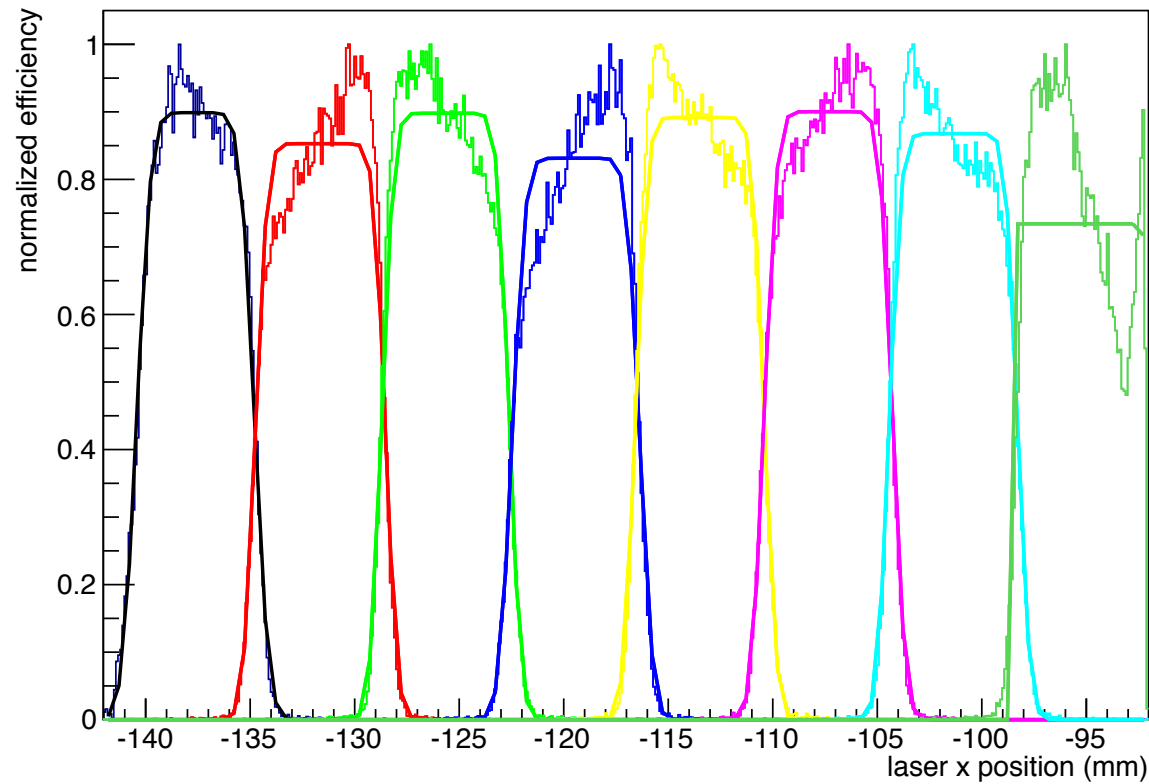
MORE PRONOUNCED SHAPE IN Y  
VARIATION IN MEAN  $\sim 150$ ps





# POSITION DEPENDENCE

## Pad hit efficiency



8 PAD SCAN IN X

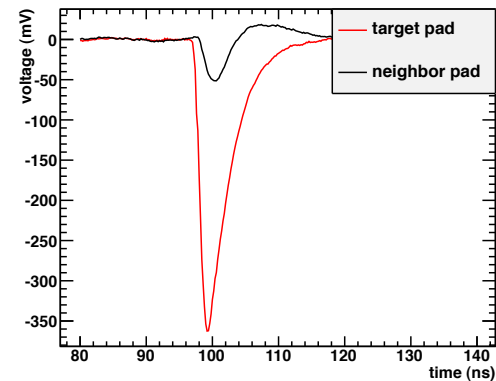
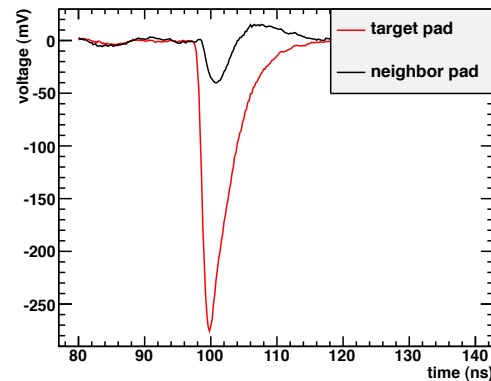
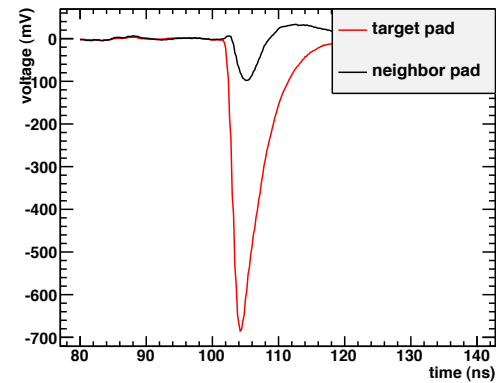
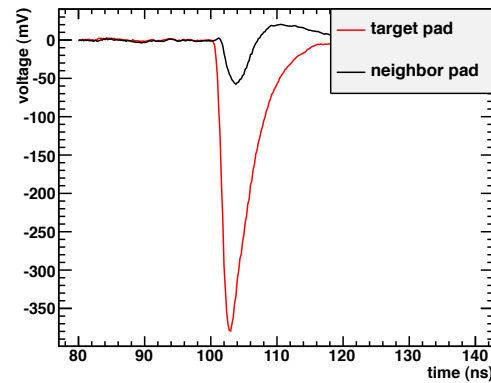
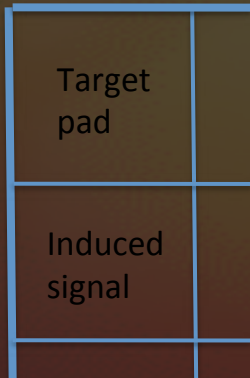
FIT TO BOX CONVOLUTED WITH A GAUSSIAN  
GAUSSIAN SIGMA FOR INTERNAL PADS  $\sim 450 \mu\text{m}$   
FOR EDGE PADS,  $\sim 540 \mu\text{m}$   
( $4\sigma$  BEAM SPOT  $\sim 50 \mu\text{m}$ )

# POSITION DEPENDENCE

- THIS IS AN EFFECT THAT IS CURRENTLY NOT IN THE SIMULATION
- QUESTION: SHOULD WE PUT THIS EFFECT IN WHEN GENERATING CONSTANTS?
  - THIS IS A STUDY THAT SHOULD BE DONE



# CAPACITIVE CROSS-TALK IN PRE-AMP BOARDS



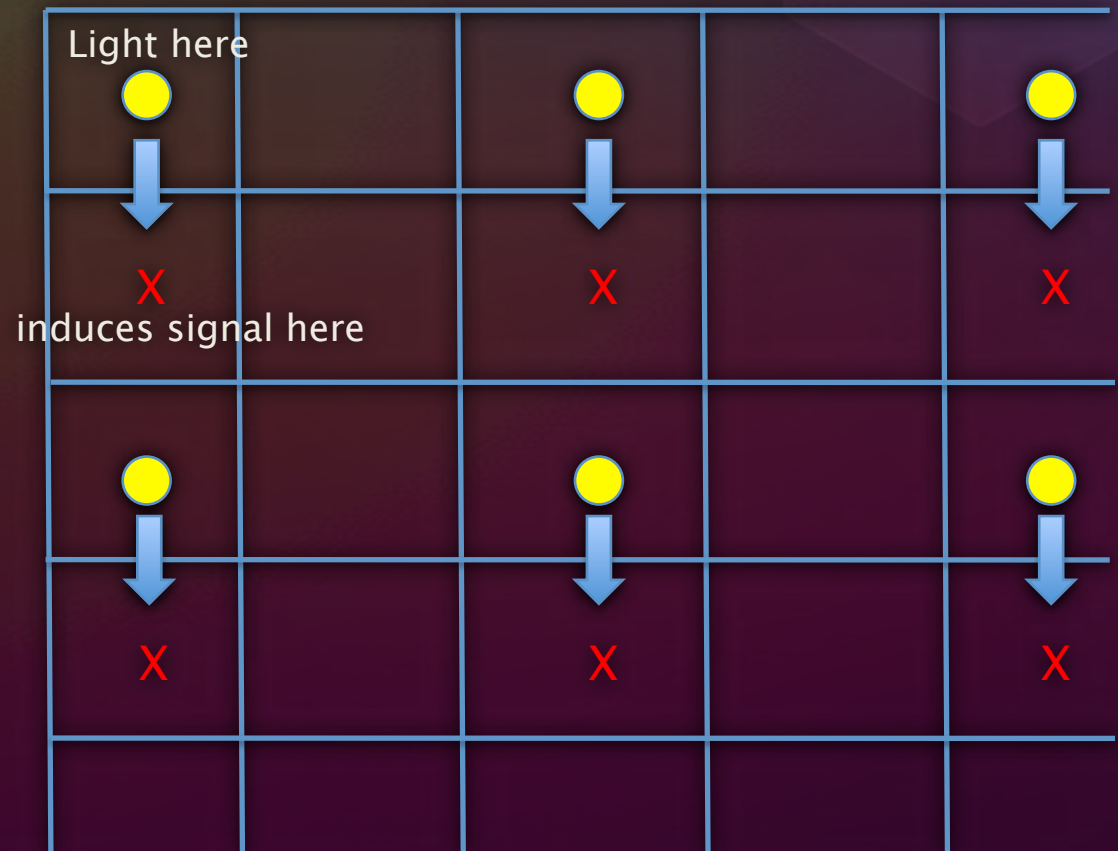
INDUCED SIGNAL

CAPACITIVE SIGNAL PROPORTIONAL TO MAIN SIGNAL,  
INDEPENDENT OF POSITION IN PAD.



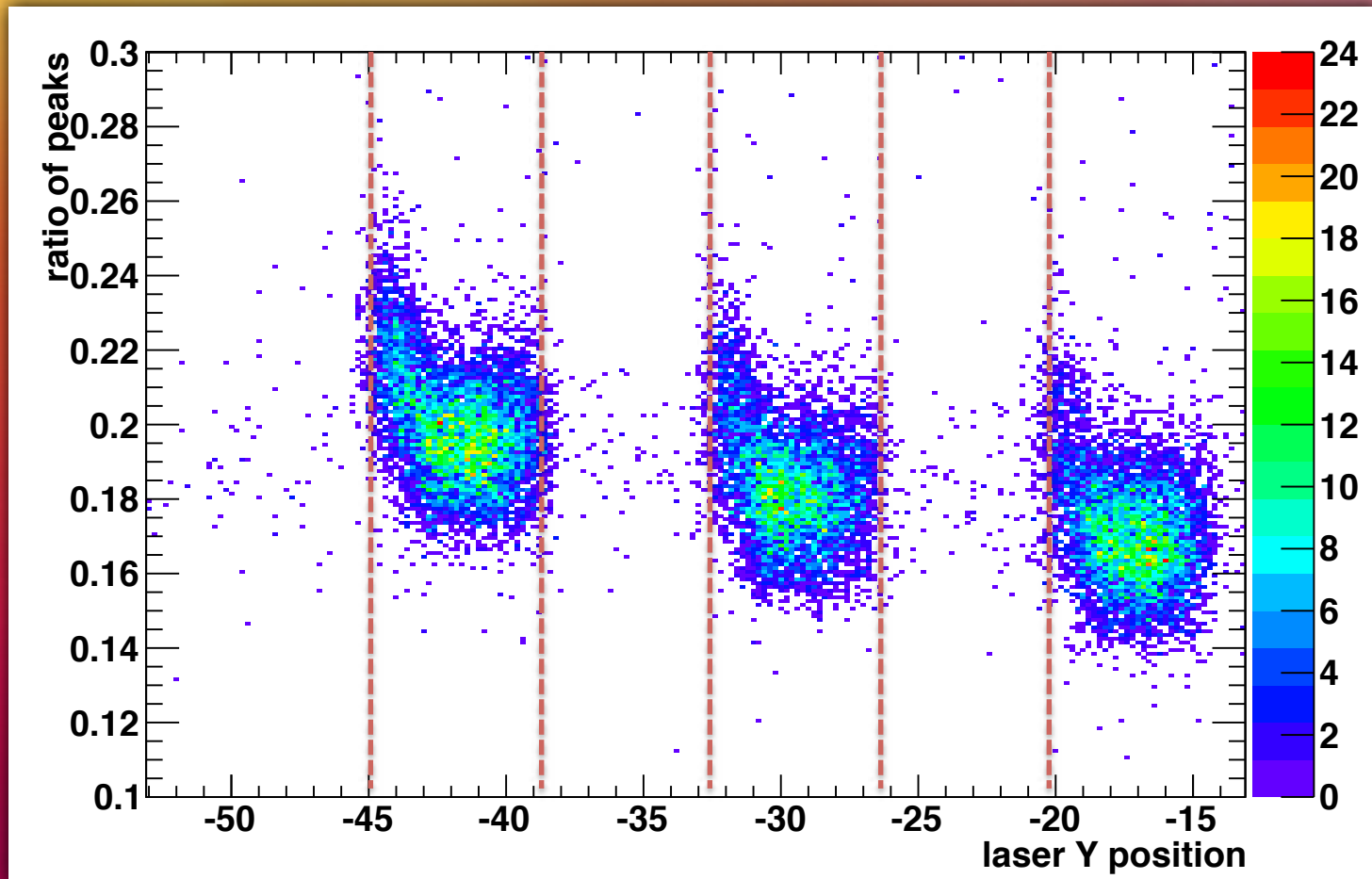
# AFFECTS ONE OUT OF EVERY FOUR CHANNELS

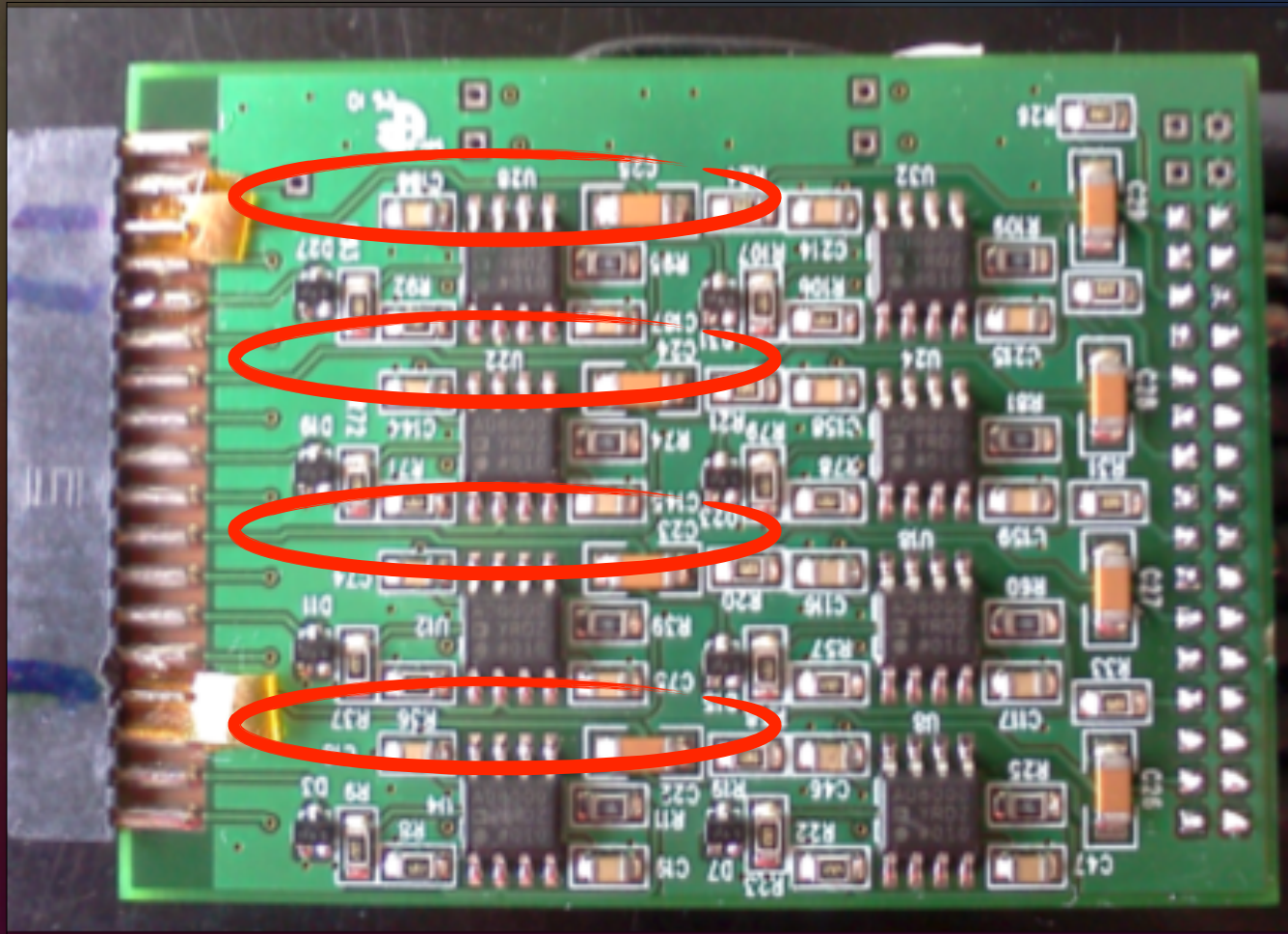
SIGNAL INDUCTION IS ONE-WAY:  
IF LIGHT ON ONE PAD INDUCES A  
SIGNAL ON NEIGHBOR, LIGHT  
ON NEIGHBOR DOES NOT  
INDUCE SIGNAL ON ORIGINAL  
PAD.



# CHARACTERISTICS OF INDUCED SIGNAL

RATIO OF PEAK HEIGHT ON INDUCED SIGNAL TO TARGET  
PAD. CONSISTENT ACROSS PADS, ~20%.  
NOTE: INTEGRATED CHARGE MUCH LOWER...





## LAYOUT OF PRE-AMP BOARDS

4 CHANNELS THAT PICK UP INDUCED SIGNAL HAS LONG TRACE  
THAT PASSES VERY CLOSE TO OUTPUT PIN OF CHIPS THAT  
INDUCE SIGNAL.



# CONCLUSION

- AT LOW INPUT LIGHT LEVELS, INDUCED SIGNALS ALMOST ALWAYS BELOW TRIGGER THRESHOLD
  - ON THE ORDER OF SIZE OF NOISE
- COULD REMOVE INDUCED SIGNALS IN SOFTWARE DUE TO PREDICTABLE TOPOGRAPHY, LOW CHARGE, KNOW RATIO TO TARGET SIGNAL
- JUST NEED TO BE AWARE THAT THEY ARE THERE...