TPAC progress

Jamie C

29th July 2008

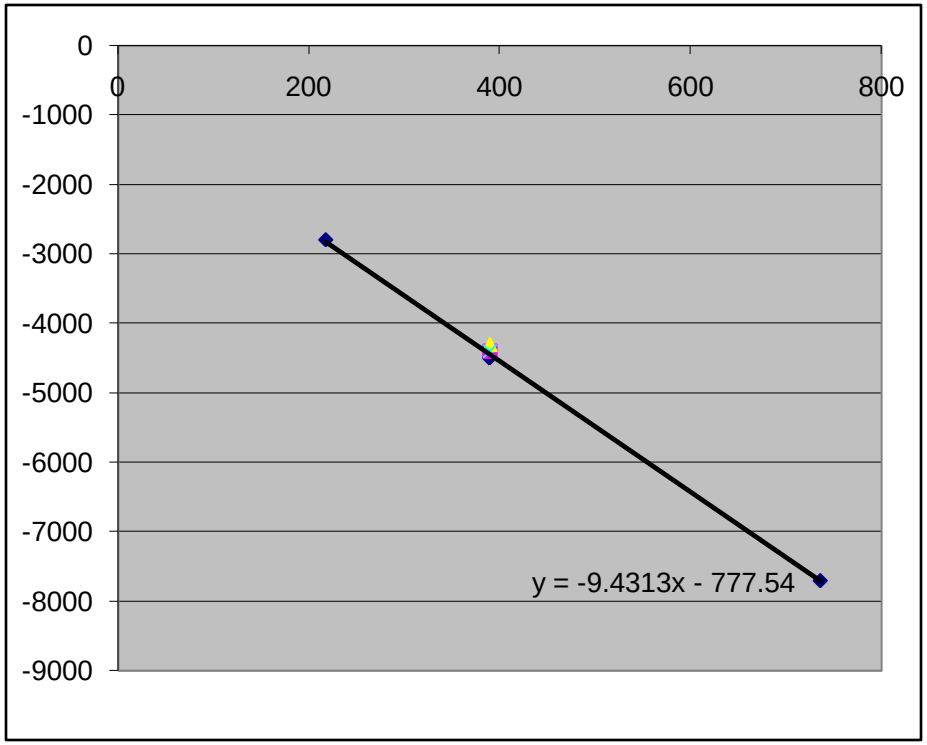
TPAC1.1 Status

- Submitted 17th
  - Some minor DRC errors found at foundry
  - Corrected/waived
- Re-Submitted 23rd July
  - DRC ok
  - Accepted for manufacture
- To do
  - New pin list
  - Bonding diagram
  - Updated manual
  - PCB modifications for TPAC1.1
  - Delivery date

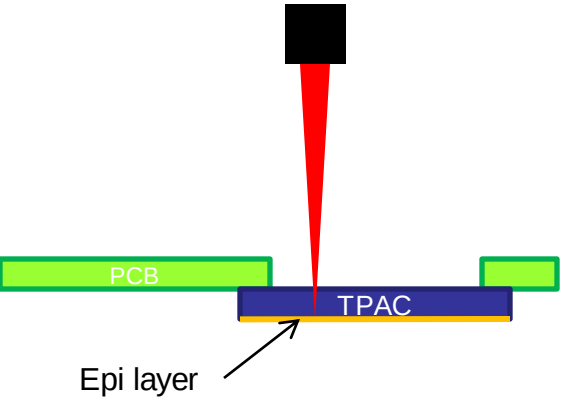
TPAC1.0 testing

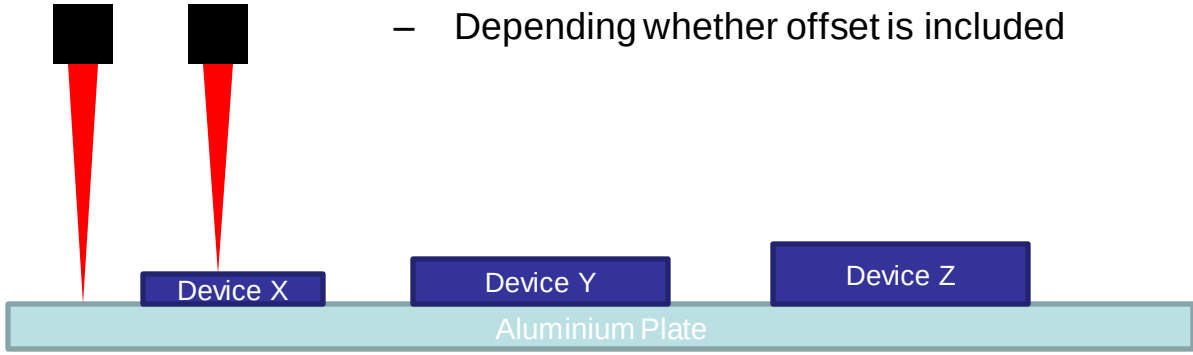
- Begin work with laser
  - FOCUS
  - PROFILES THROUGH TEST PIXELS
  - SIGNAL DELAY (→COLLECTION TIME?)

Laser Focus Calibration



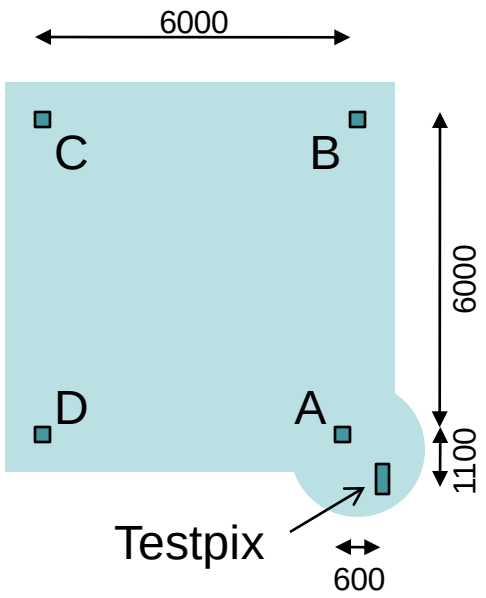
- Laser focus units are for movement of optics in microns (not focal point)
- Calibrate focussing
  - Took 3 chips from different processes
  - Measured thickness in Metrology lab
  - Measured focus setting required to view aluminium base plate
  - Measured focus setting required to view top surface of each chip
  - Some offset (~70um) maybe due to interface with chip sitting on aluminium plate (no vacuum/glue)
- Therefore TPAC's epi sits at around depth of 4000 350
  - Depending whether offset is included





Negative numbers = DOWN in software → focal point moves up

Sensor mounting

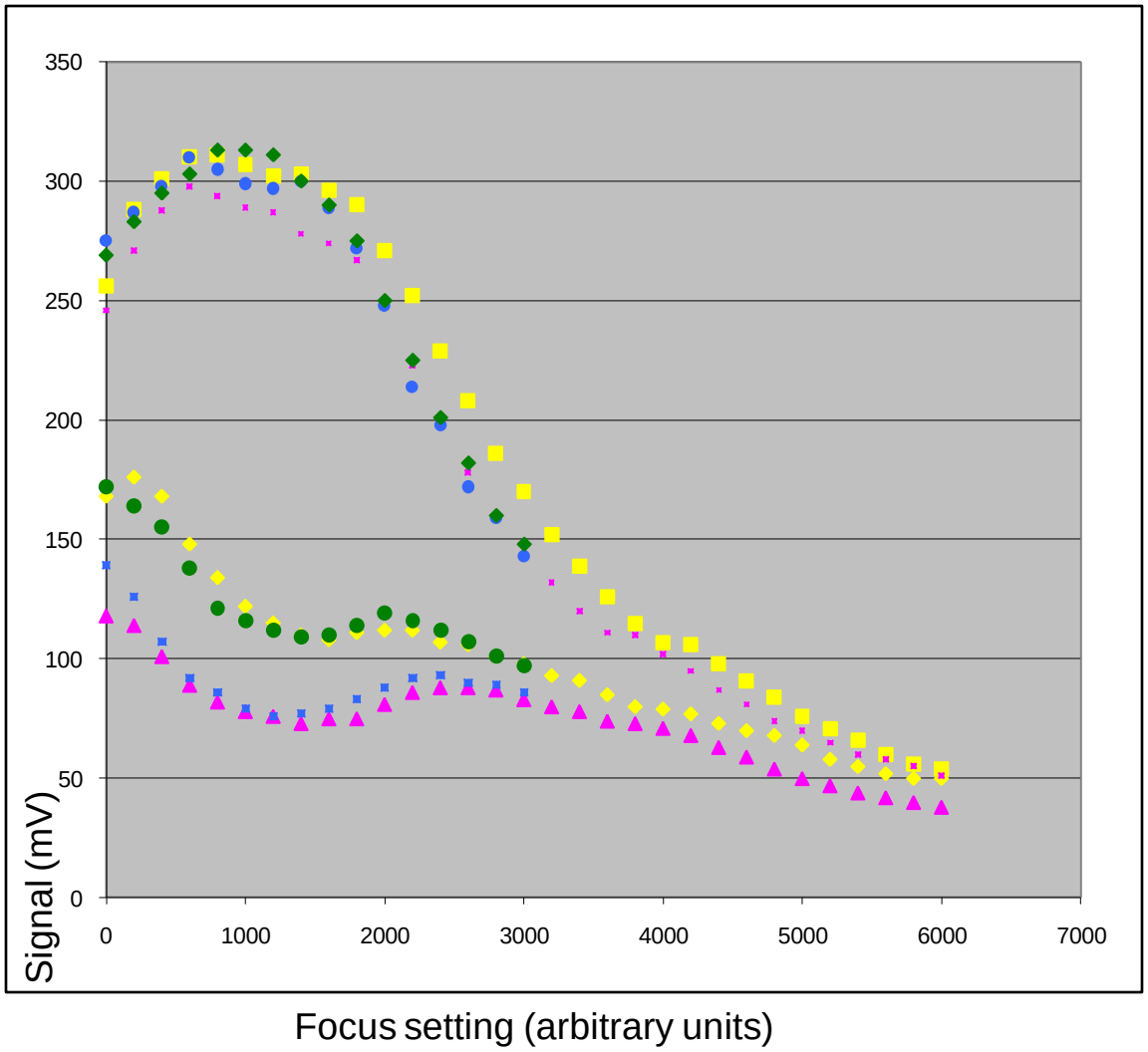


- Check focus of sensor in 4 corners and over test pixels

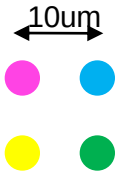
Location	Focus Δ	Microns Δ
Test pix	0 (ref)	
A	-90	
B	-920	
C	-690	
D	+130	
Full scale	1050	~110μm

Negative numbers = DOWN in software → focal point moves up

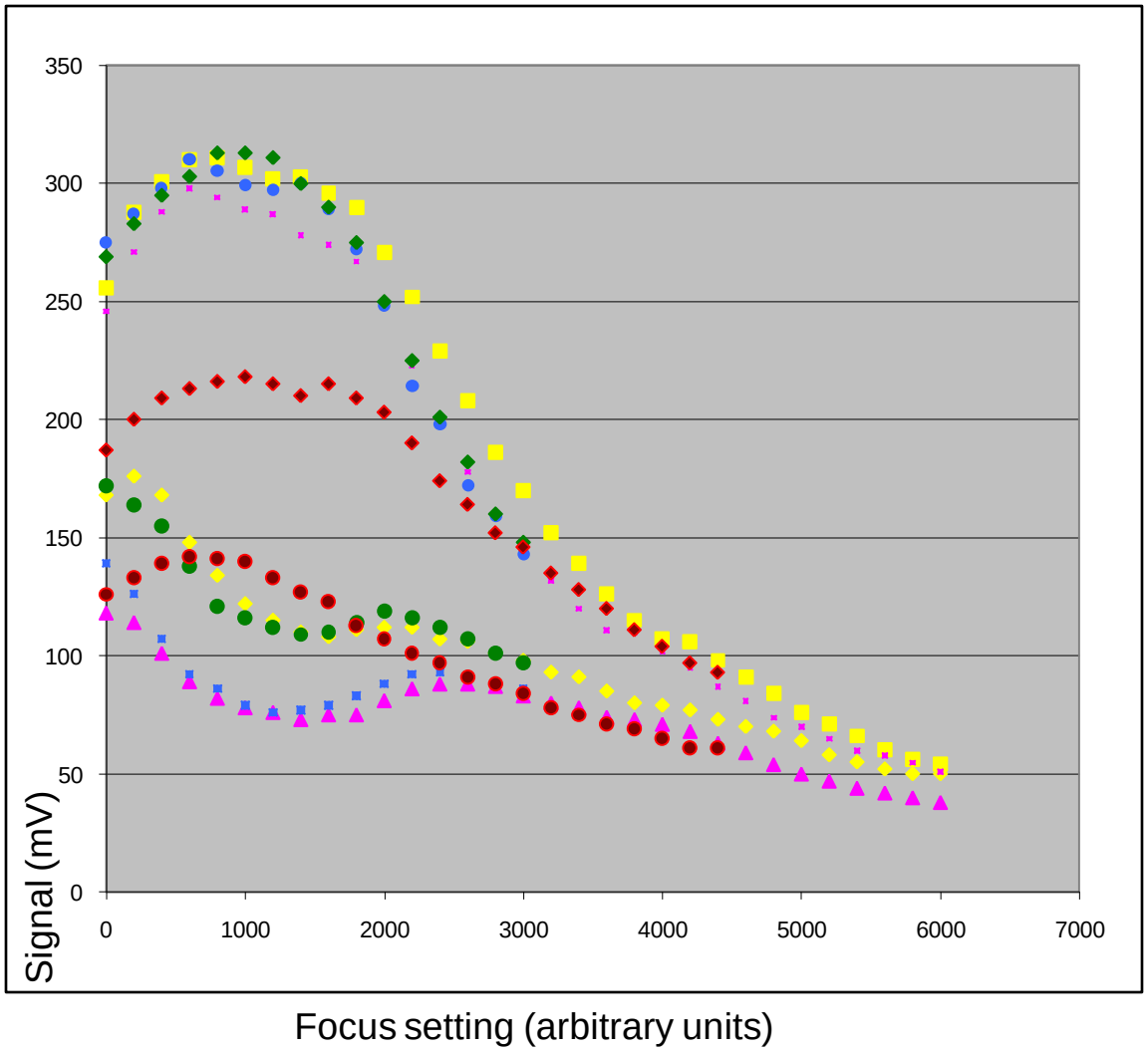
Laser focus: first results



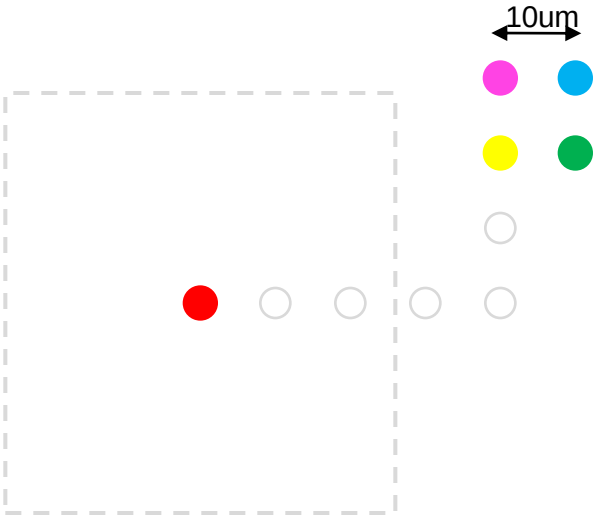
- Focussed on back of sensor
- Found position to give local maximum signal
- Scan focus in 4 positions on 10μ grid
- Record signal from two adjacent test pixels



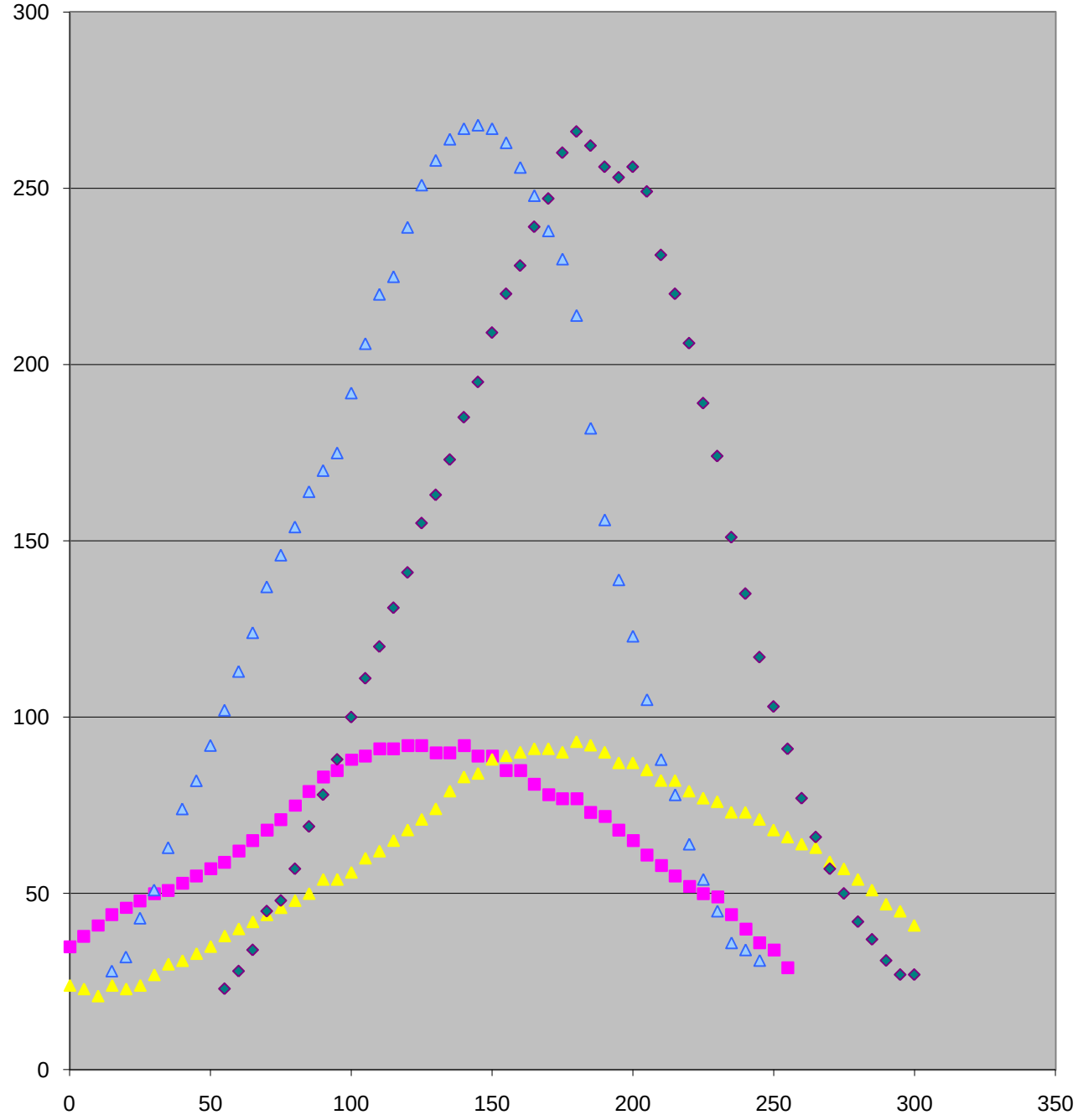
Laser focus: more results

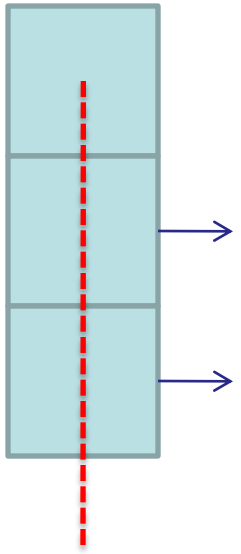


- Focussed on epi (approx)
- Found position to give local maximum signal
- Repeat a scan of focus at this point
- Record signal from two adjacent test pixels

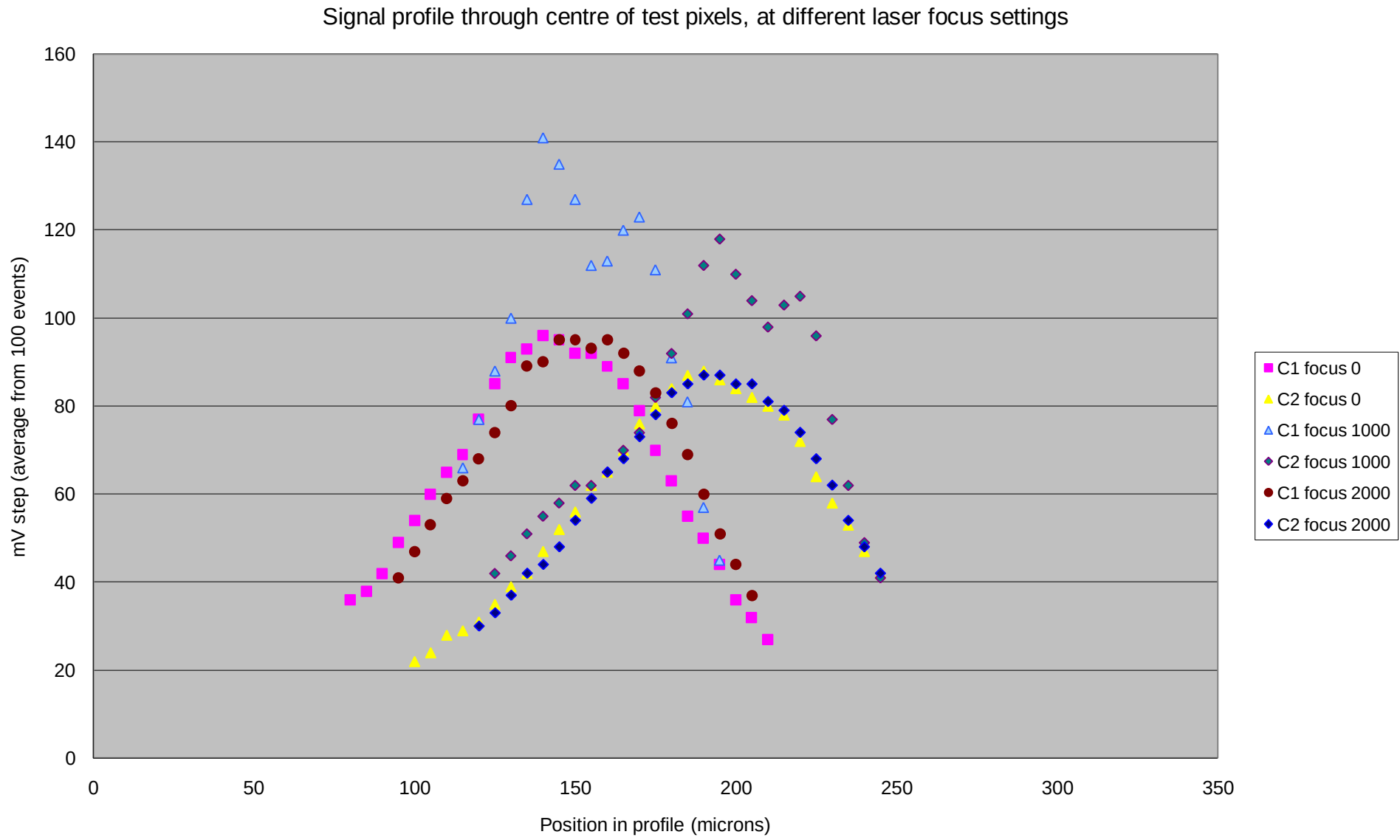


Signal Profile through test pixels

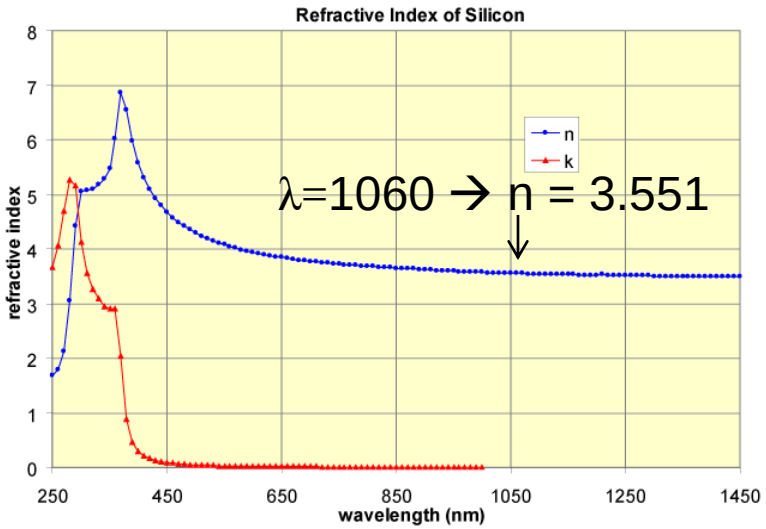




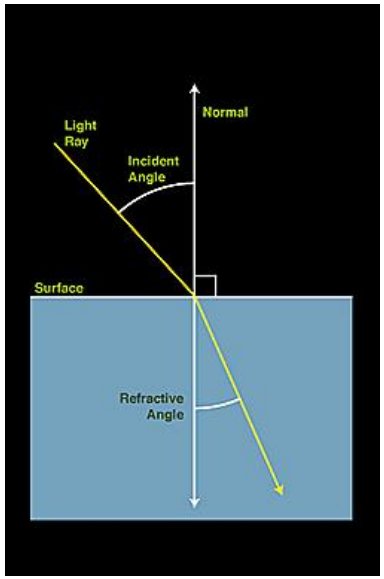
Focus 0 (back)
Focus 4000 (epi)

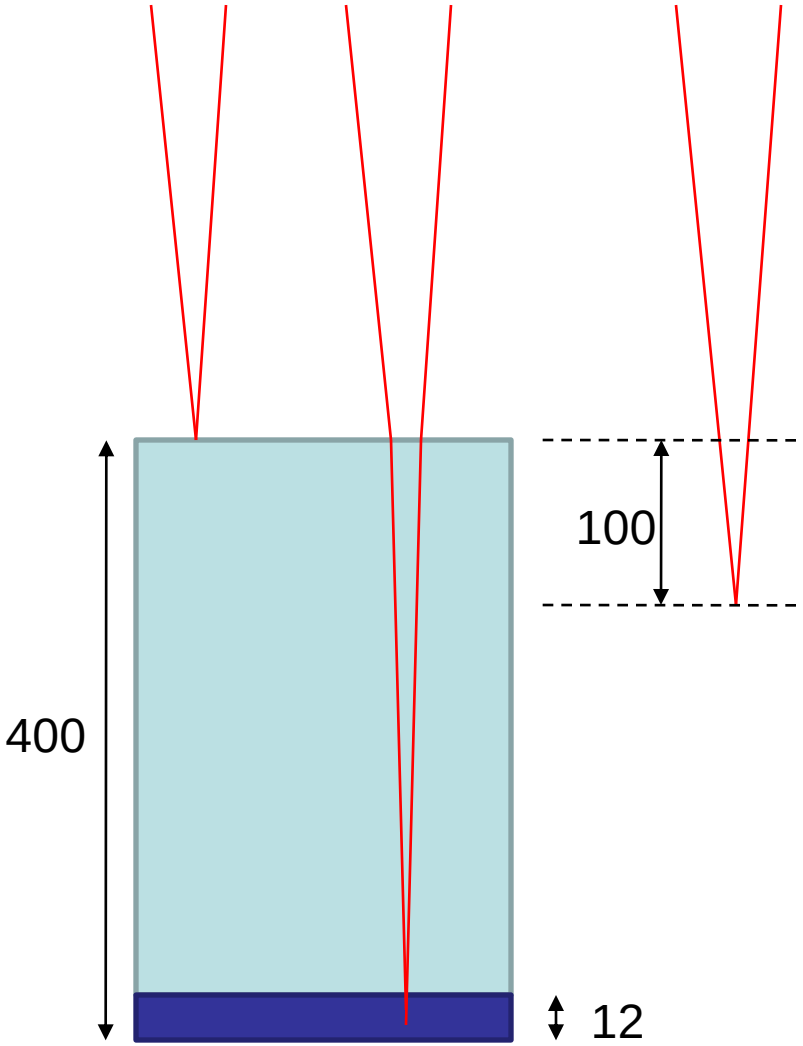

Signal profile through centre of test pixels, at different laser focus settings
mV step (average from 100 events)
160
140
120
100
80
60
40
20
0
0
50
100
150
200
250
300
350
Position in profile (microns)
C1 focus 0
C2 focus 0
C1 focus 1000
C2 focus 1000
C1 focus 2000
C2 focus 2000

Optical properties of silicon



http://www.udel.edu/igert/pvcdrom/APPEND/OPTICAL.HTM
http://www.ps.missouri.edu/rickspage/refract/refraction.html

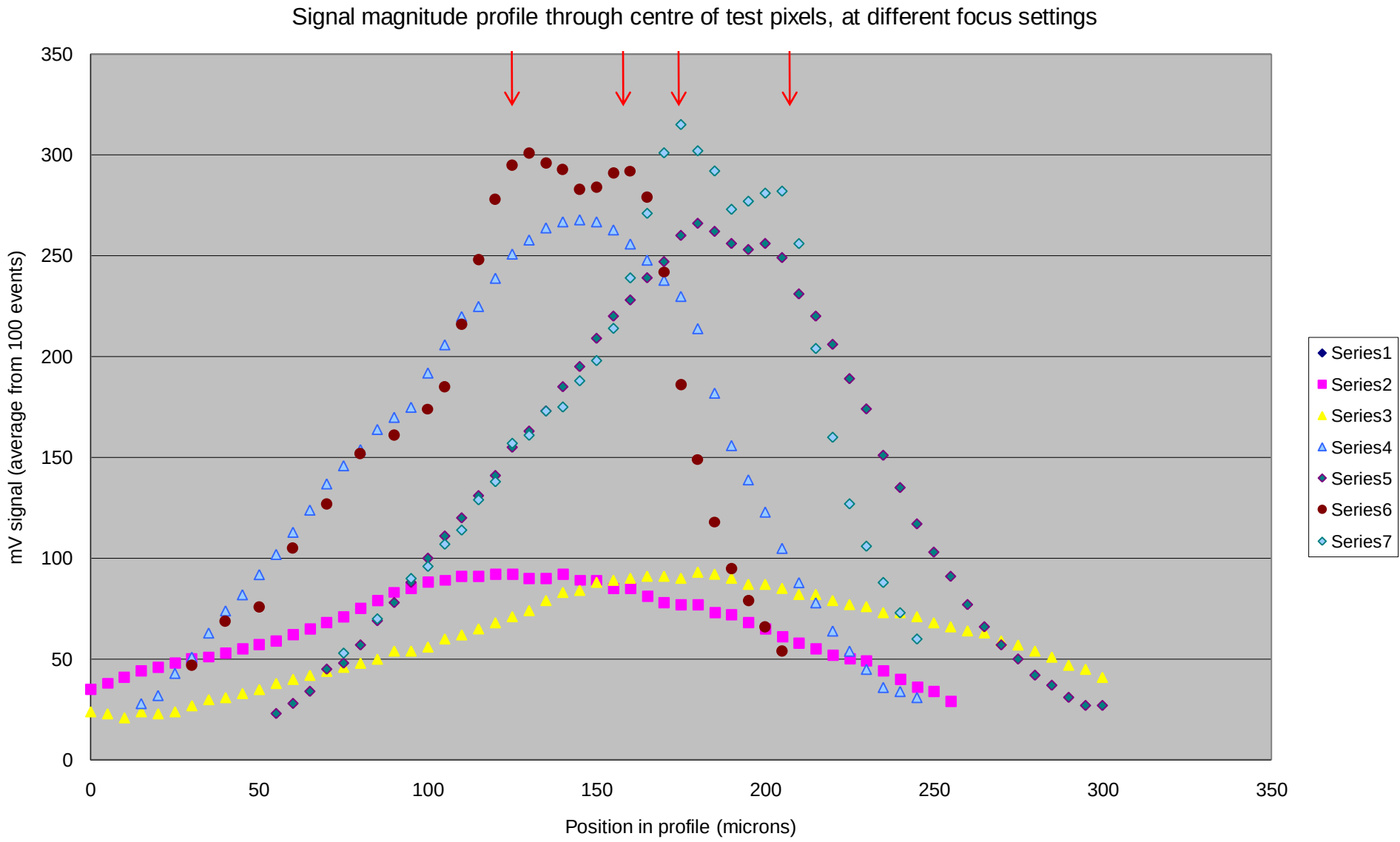




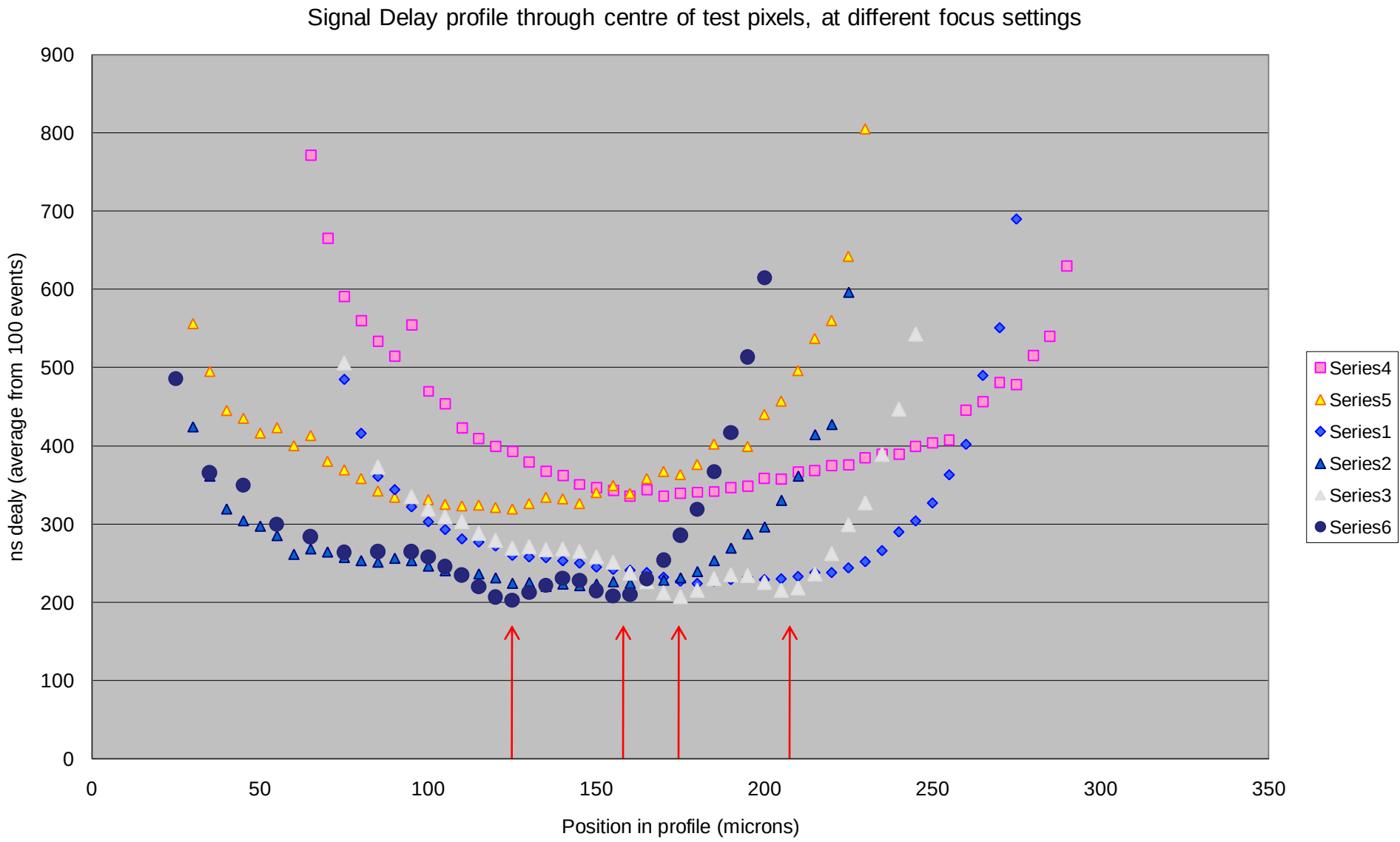
Example:

$\theta^i = 1^\circ \rightarrow \theta^r = 0.28^\circ$

…another dataset with larger signal magnitude & time delays recorded: focus 0, 1000, 4000



“delay” → scope measures time from trigger (laser generated) to signal crossing 30mV



interesting structure in time delays…