

# Piezo-optical POC immunoassay

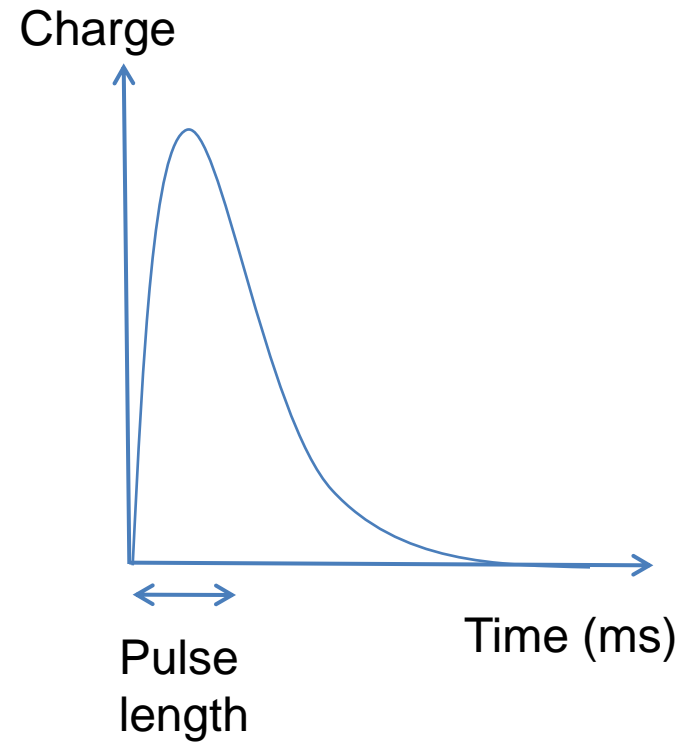
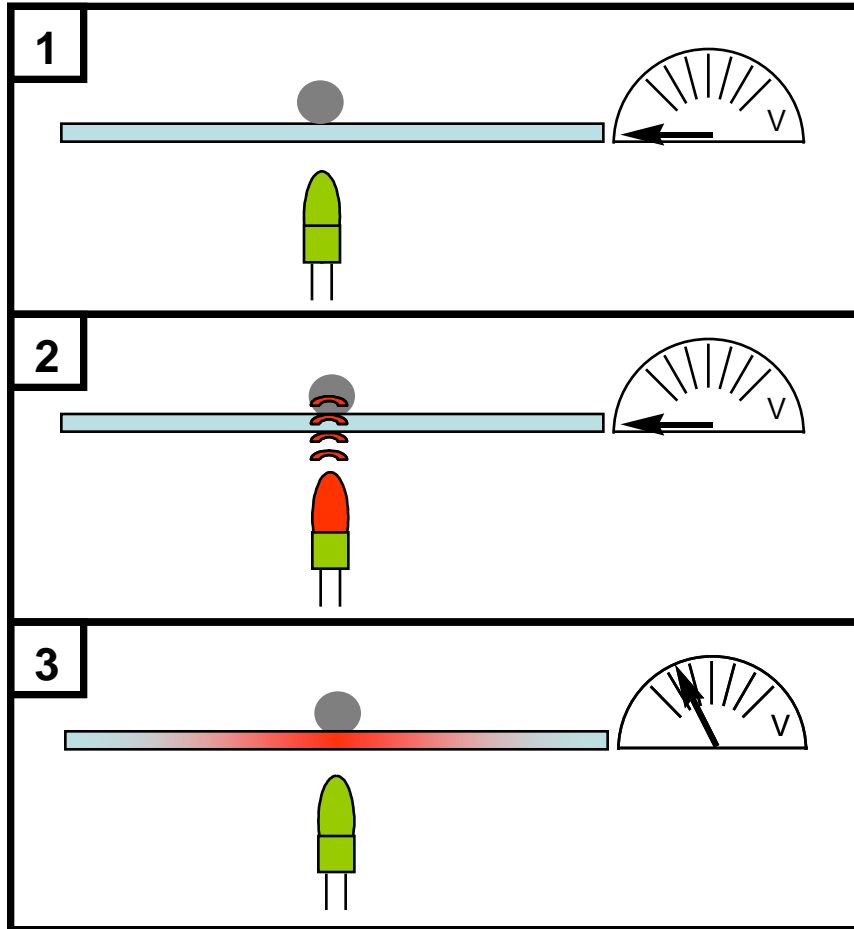
## Steve Ross

Oak Ridge Conference  
April 2009

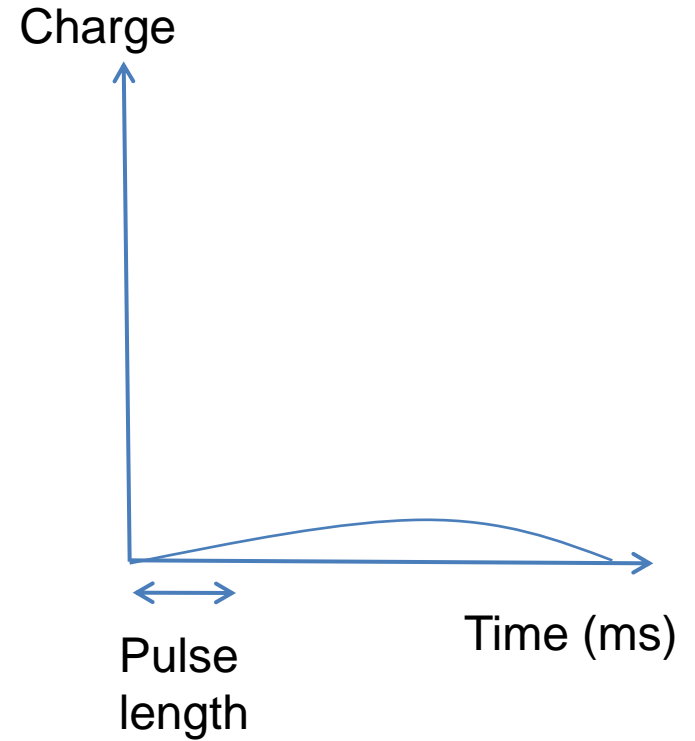
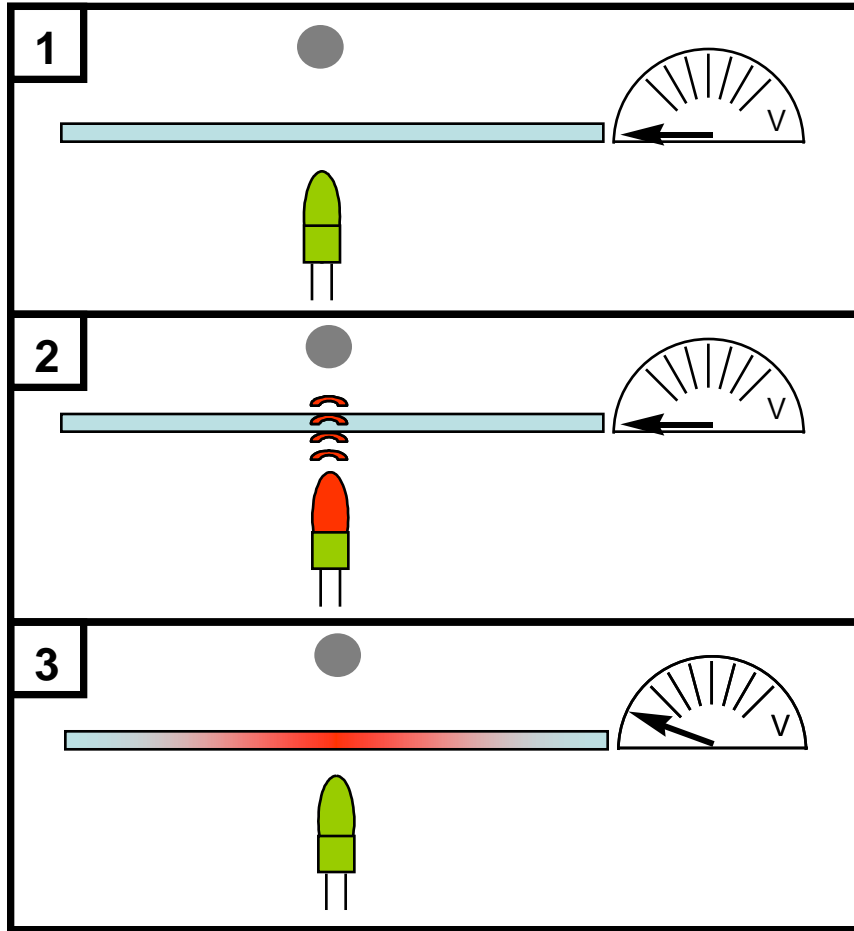
# Piezo-optical signal generation

- Polyvinylidene fluoride can be manufactured as a piezo/pyroelectric film
- The film responds to thermal and mechanical “shocks” to generate charge
- Thermal and mechanical shock can be generated by a light pulse which is absorbed in a sample adjacent to the piezofilm
- Time-resolution of the signal allows spatial discrimination between the surface of the polymer and the bulk of the sample

# Time-resolved signal – adjacent to film

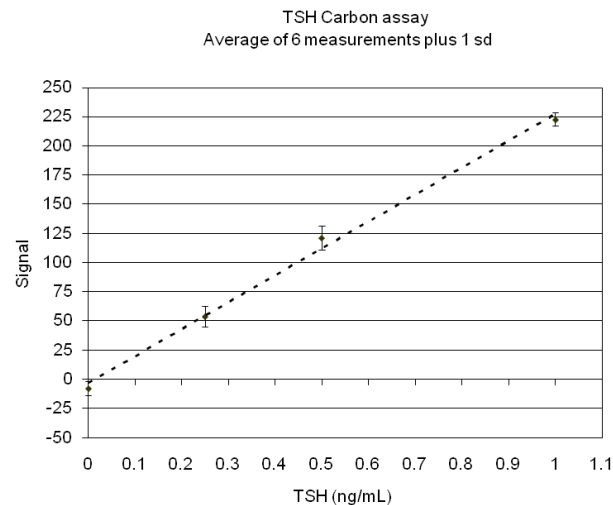


# Time-resolved signal – removed from film



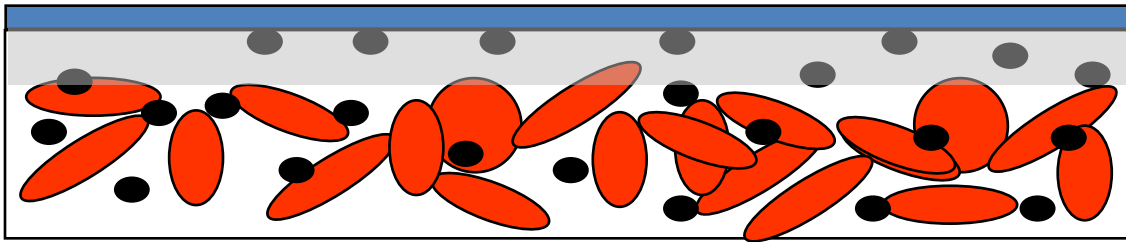
# Assay principles

- Piezofilm coated in antibody
- Sample and carbon label pre-mixed in cartridge
- Analyte and carbon label diffuse to piezofilm surface over time
- Kinetics monitored by pulsing light from an LED source and measuring binding of carbon at surface
- Kinetic profile gives measure of analyte concentration

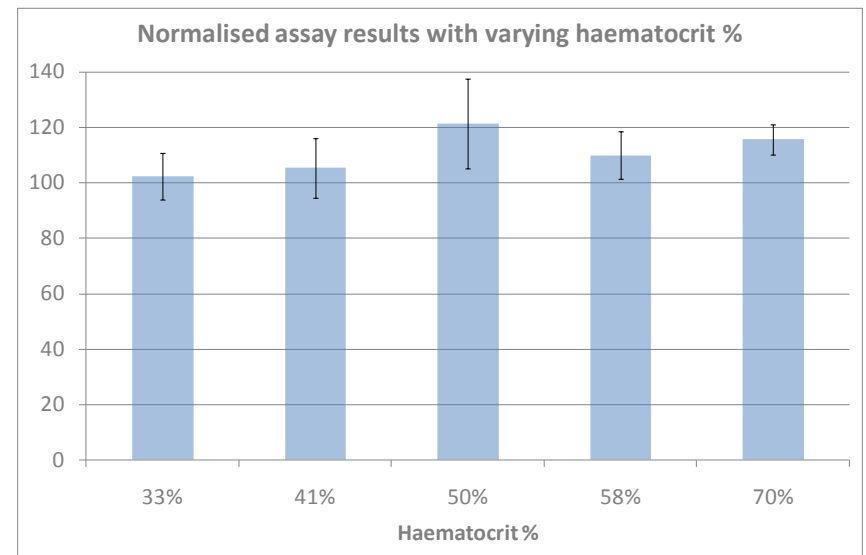


# Whole blood measurements

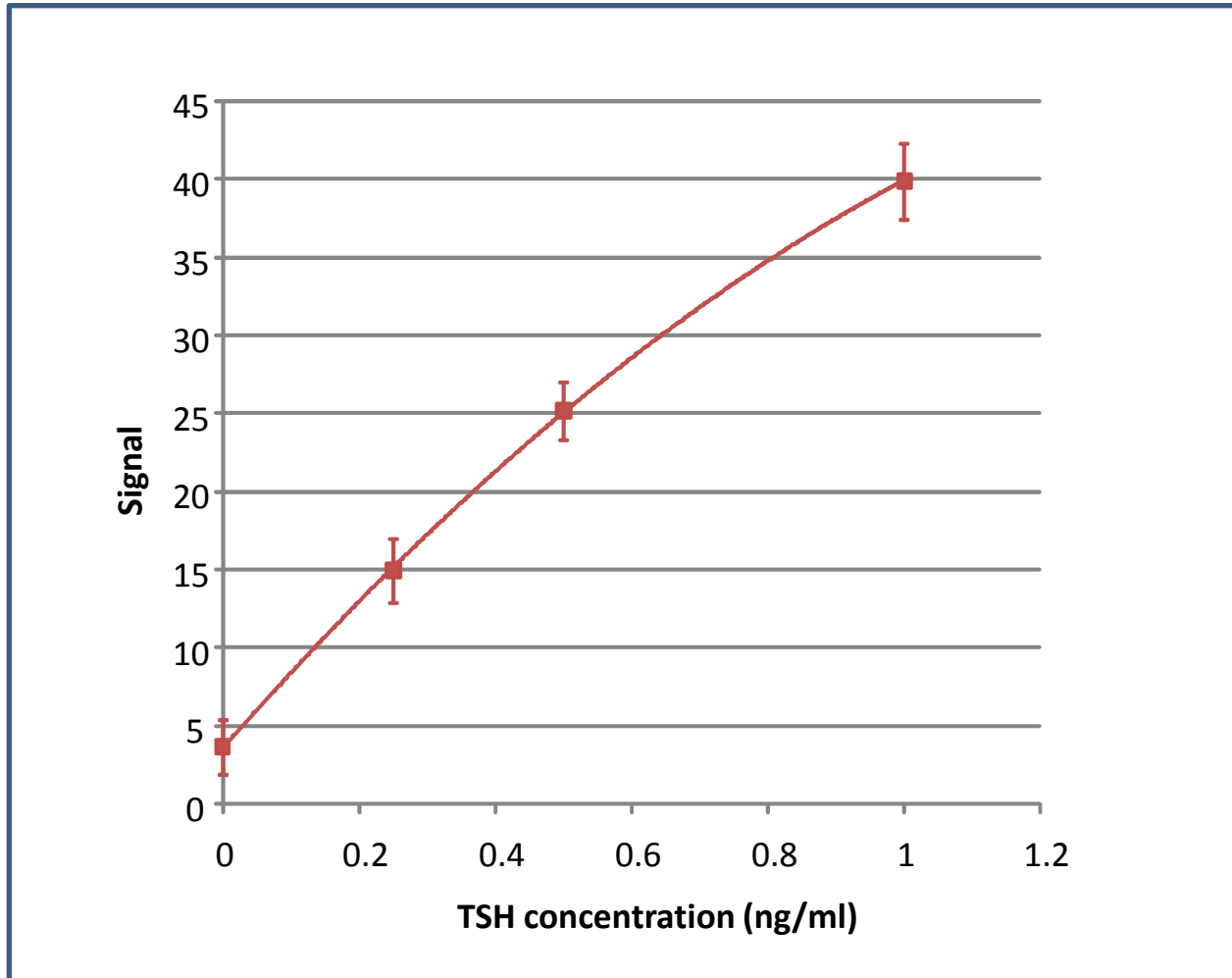
- Horizontal orientation to create plasma-rich layer at surface coupled with time resolution of signal



- Output
  - plasma concentration
  - (hematocrit independent)



# Calibration curve in whole blood



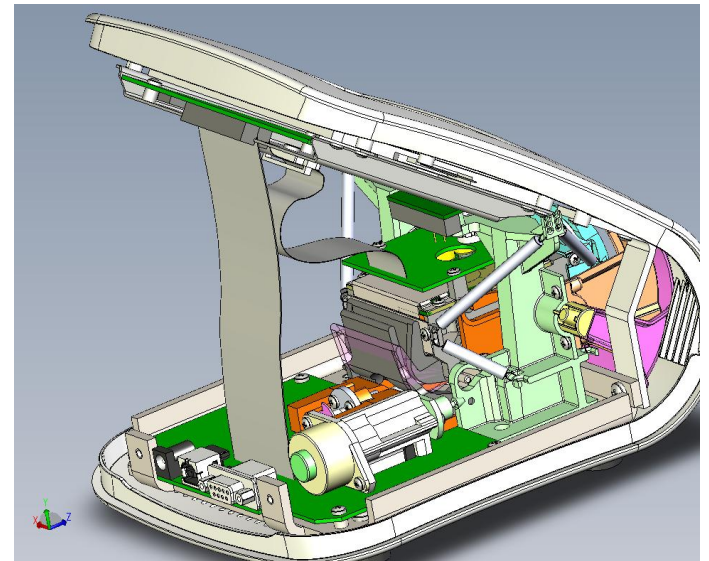
# Disposable cartridge design

- Injection moulded core plus laminates
- Simple fluidic mixing system
- 3 chambers
  - measurement
  - Positive control + internal calibrant
  - negative control
- Anti-reinsertion feature



# Reader development

- All data generated on custom lab prototypes
- Now moving towards engineering prototype final instruments
- First instrument due 24/04/09
- 50 instruments due Sept 09



# Benefits

- Measurement in homogeneous or “dirty” sample
- No red cell separation
- No wash steps
- 30  $\mu\text{L}$  sample
- High sensitivity (20 pg / mL)
- Fast (5 mins)