



Kevin Loo: ESR 8

Third Annual ARDENT Workshop



CENTRE FOR
MEDICAL
RADIATION PHYSICS

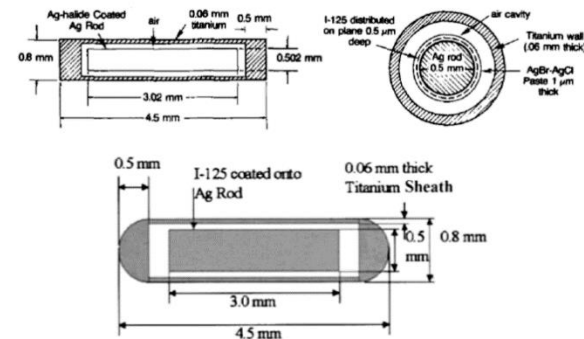
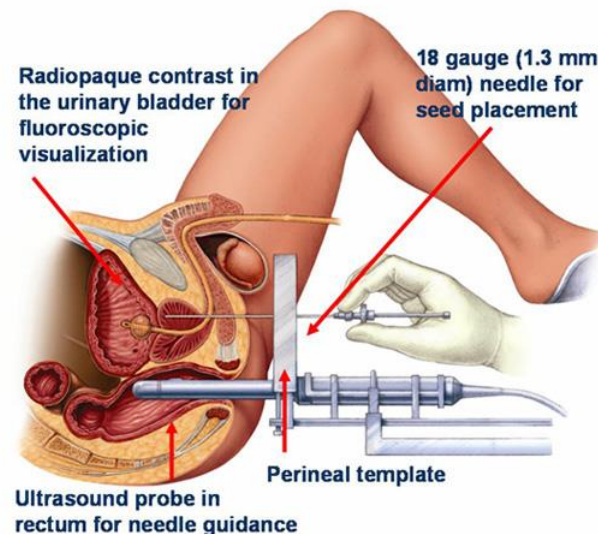


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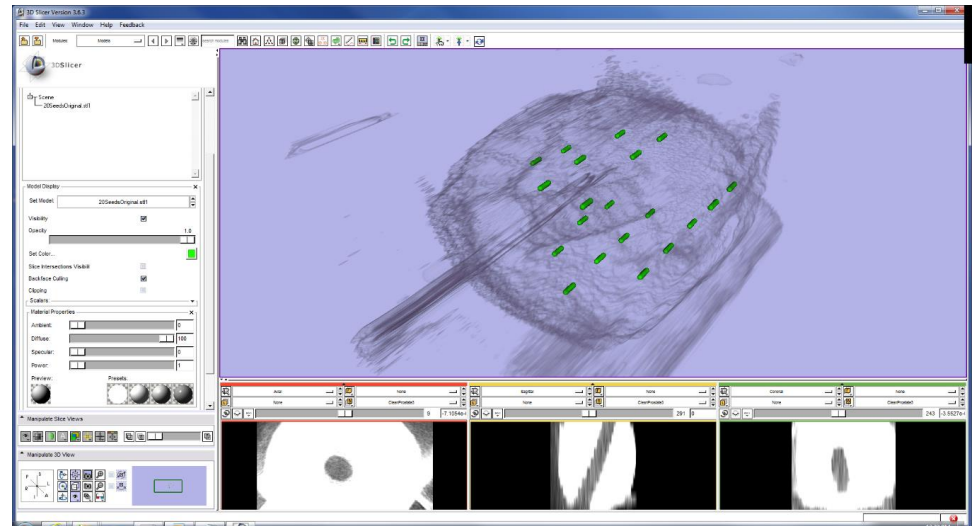
BrachyView: major progress update

- ▶ “Application of Medipix detectors for medicine and radiation safety”
- ▶ Three major studies completed for feasibility study of pinhole application of Timepix detectors
- ▶ Two publications in 2013
- ▶ 3rd nearing draft completion – under revision with supervisors
- ▶ 4th major set of data being finalised



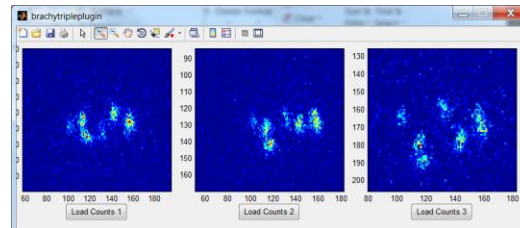
Multiple seed study

- ▶ 20 seed data fused with clinical CT scan (and even ultrasound data)
- ▶ More detailed error analysis shows little uncertainty in BrachyView approach
- ▶ However, still reliant on single detector set-up
- ▶ Development of 3D visualisation software shows much potential
- ▶ Includes supervision and advising Masters and PhD students in Australia



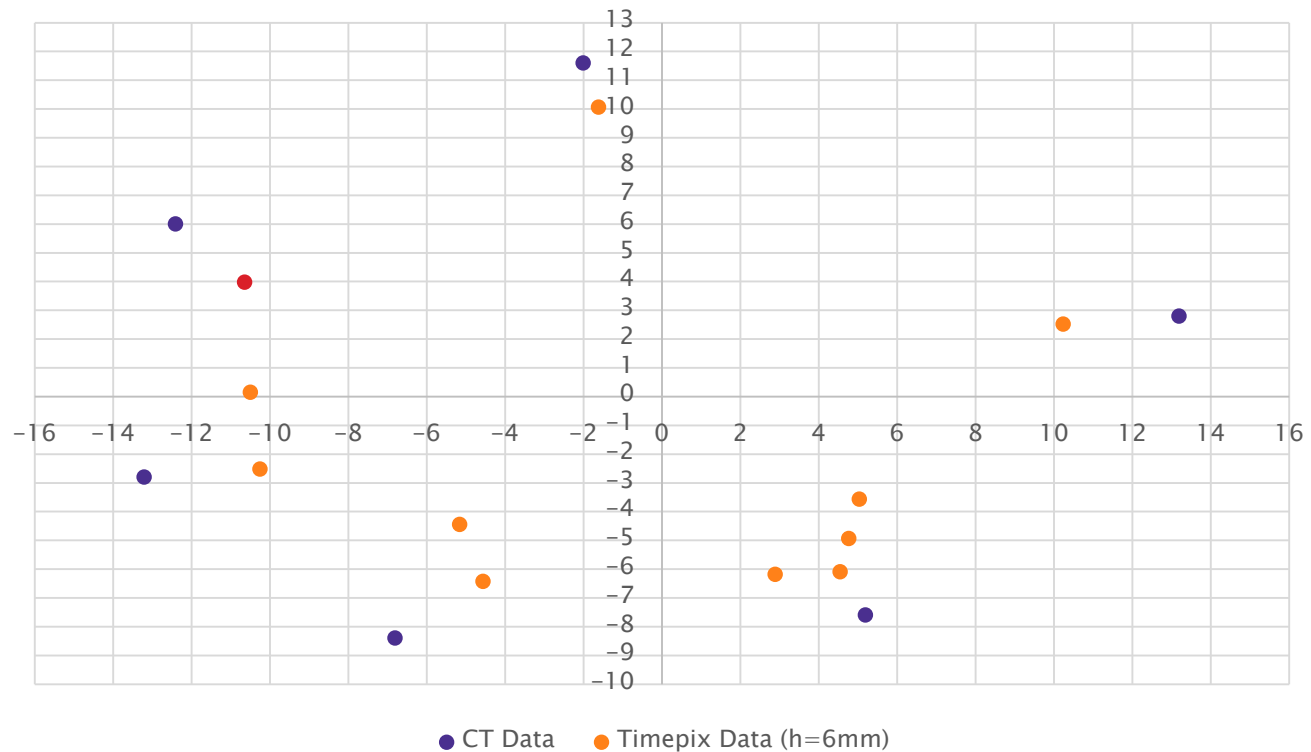
Gel phantom study

- ▶ Use medical ultrasound phantom and real TRUS data
- ▶ Data shows some systematic error, possibly due to uncertainty in detector position
- ▶ Currently under analysis



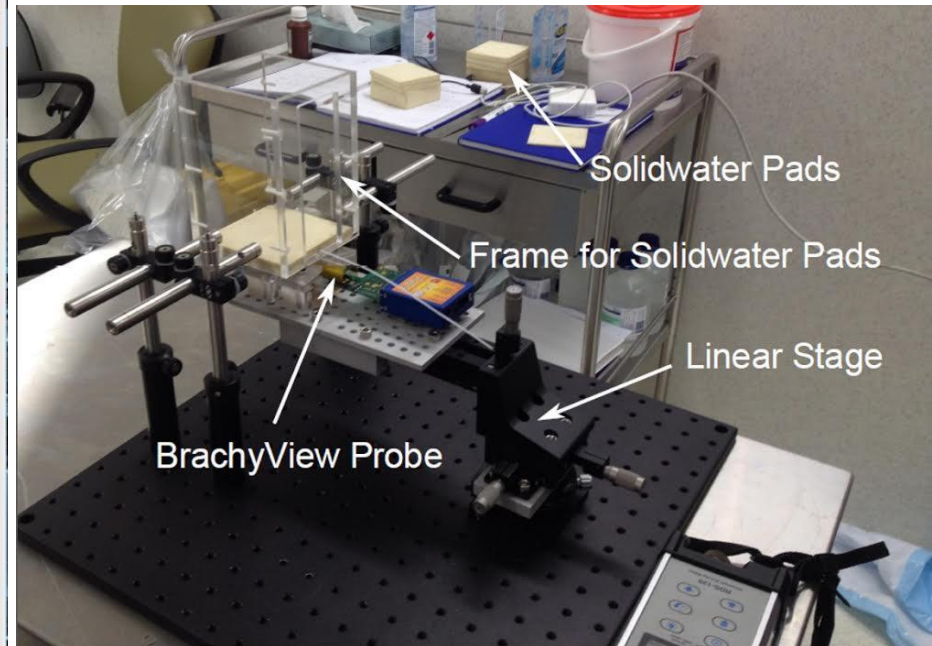
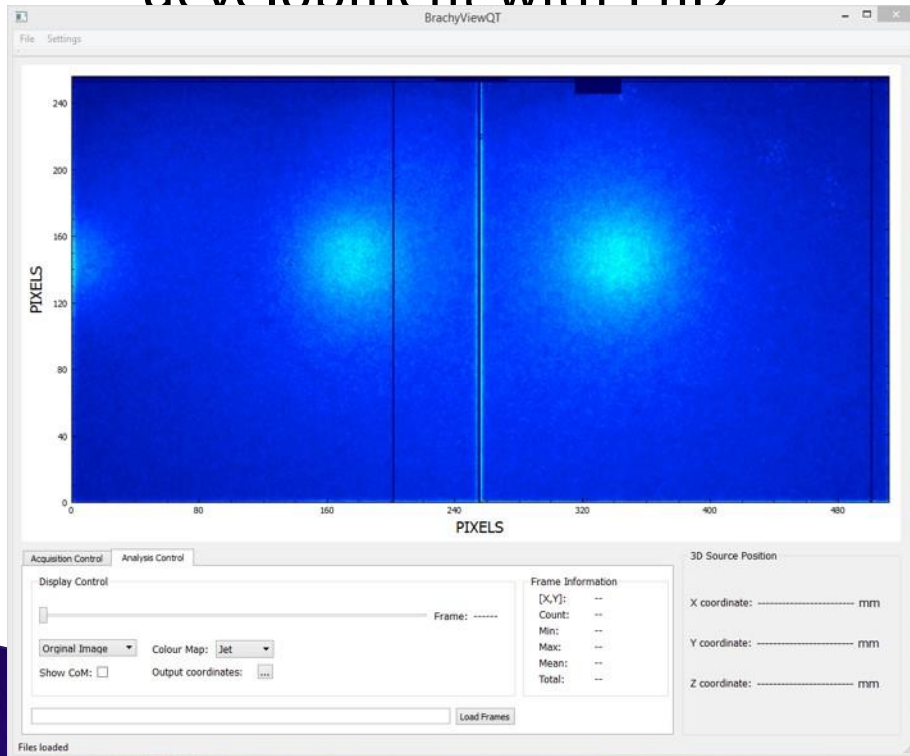
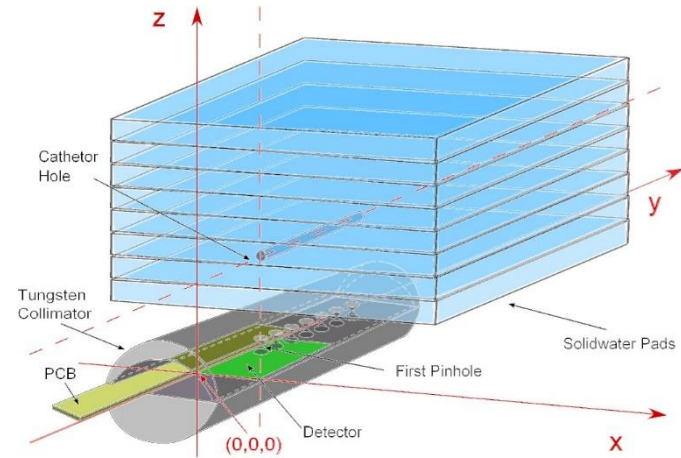
Gel phantom

Gel phantom (10 seeds)



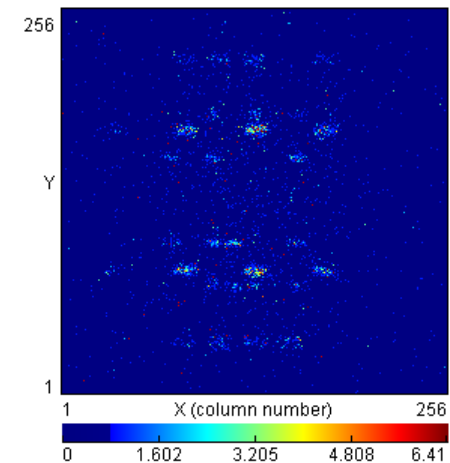
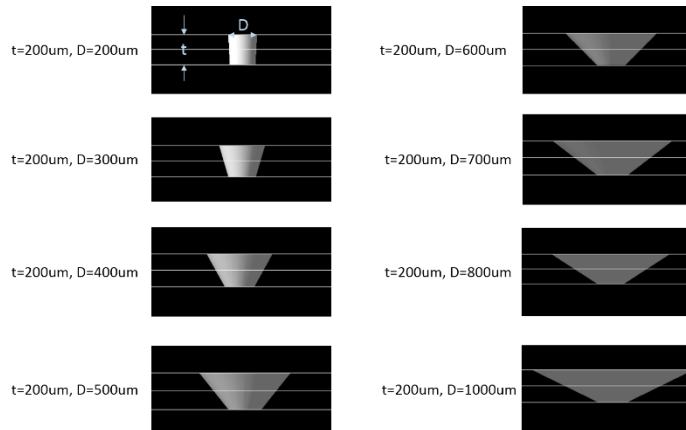
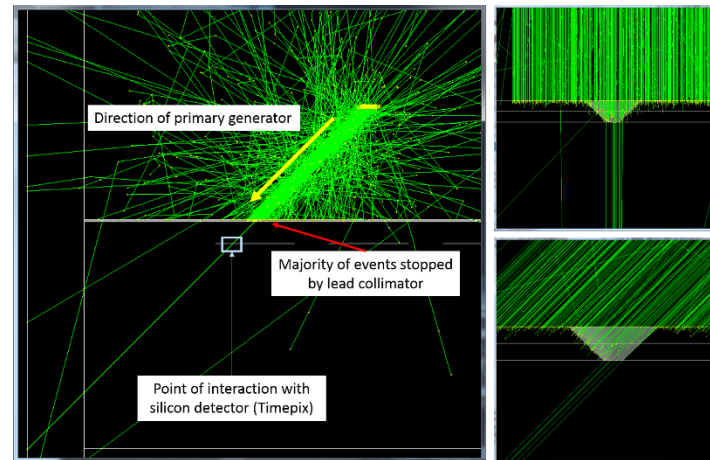
Software Development

- ▶ Interface with Pixelman to create standalone BrachyView software
- ▶ Currently in development with PhD

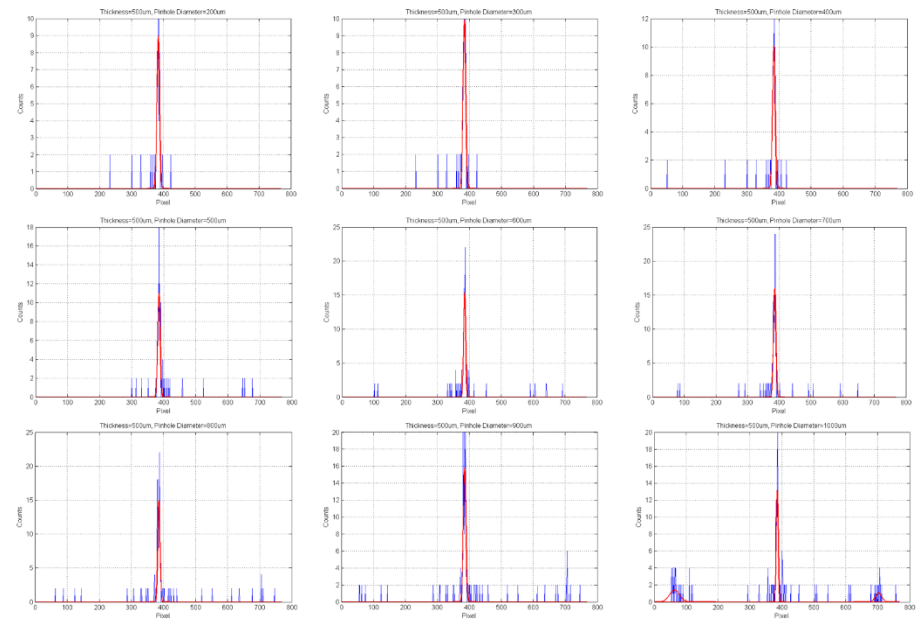
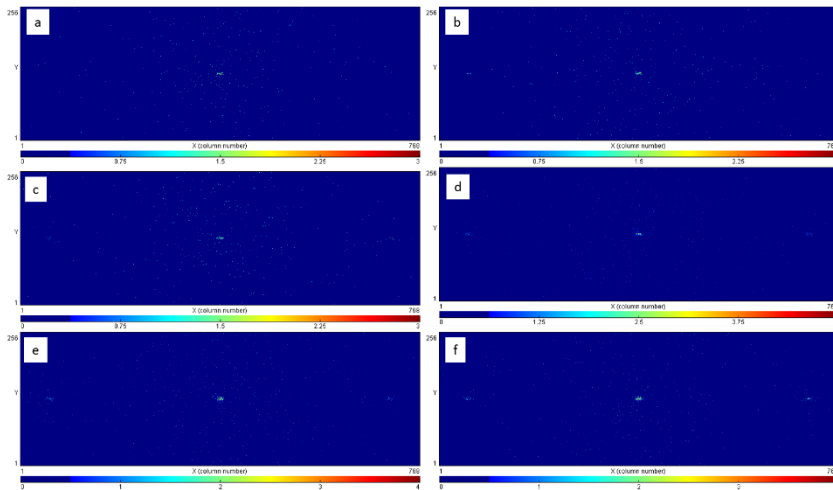


GEANT4 Study

- ▶ Pinhole characterisation
- ▶ Good preliminary results, but more statistics needed

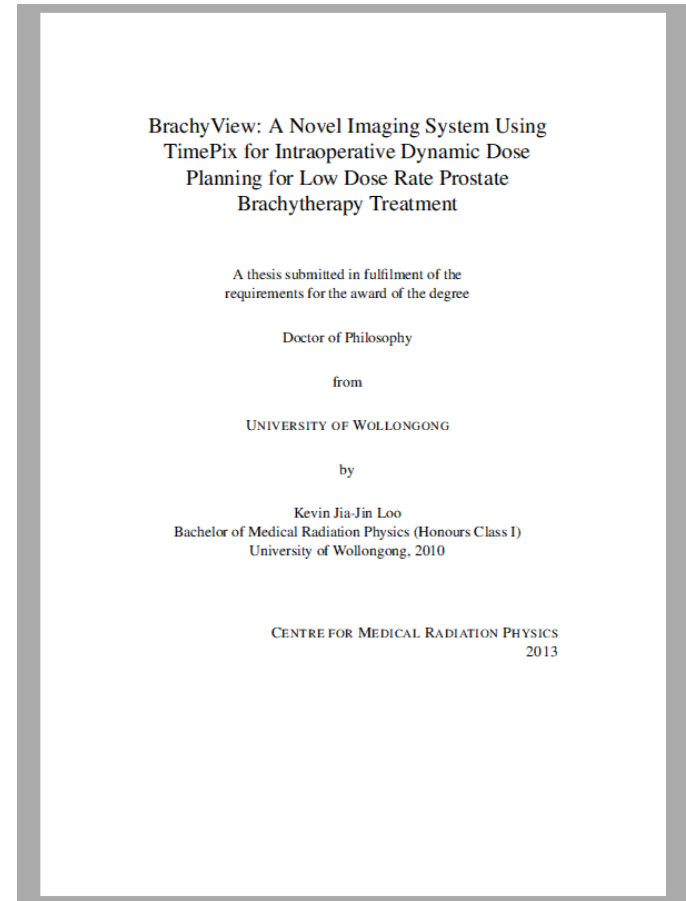


GEANT4 Study



Thesis

- ▶ Thesis due early 2015
- ▶ Third draft under review by principal supervisors
- ▶ Structure:
 1. Introduction/Lit Review
 2. BrachyView Design
 3. Simulation studies
 4. Experimental pinhole studies
 5. Tomographic studies
 6. Soft tissue diagnostic study

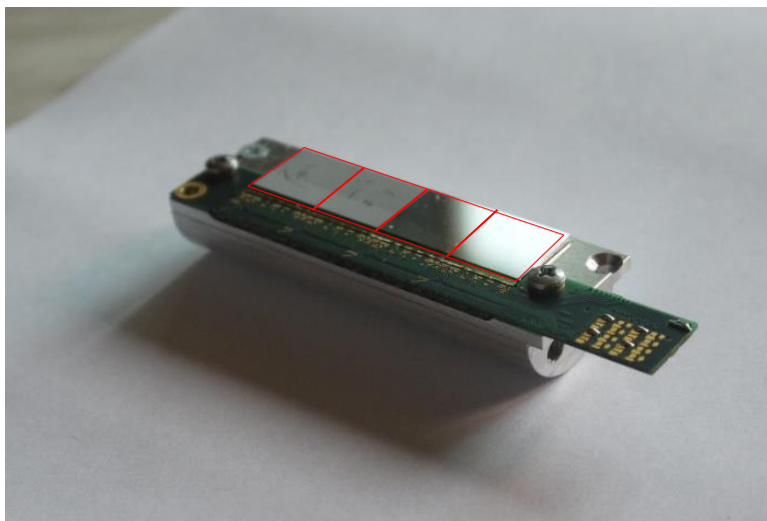


Future Work

- ▶ Development of functional quad detector using 4 x 300 um Si sensors
- ▶ Earlier prototypes tested successfully
- ▶ Pinhole characterisation should also be performed (can compare with MC results)

V1.1: triple detector, gaps between each sensor for wire bonds, 2012

V2.0: quad detector based on gapless design, new wire bonding technique



→ V2.1

Future Work: BrachyView Probe

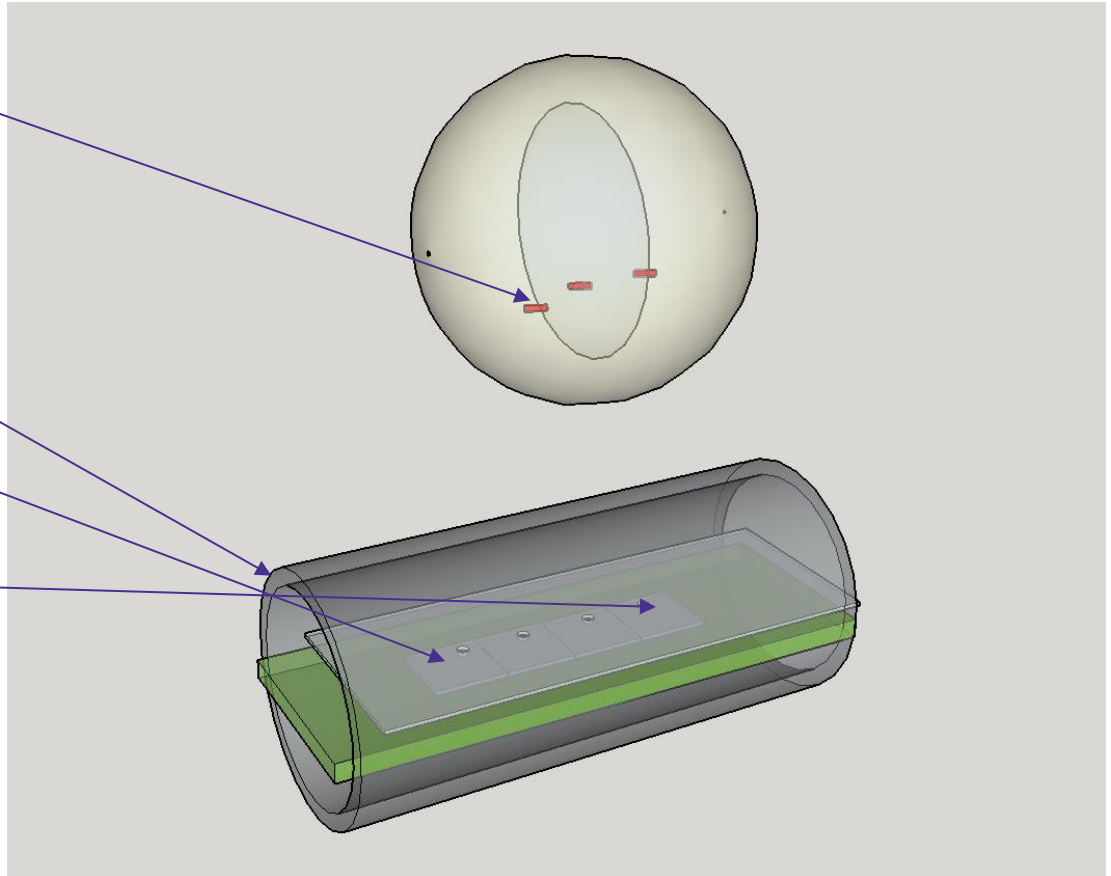
▶ Reverse-engineering of BrachyView Probe

Implanted I-125 seeds

24 mm TRUS probe

Quad detector
(14x52 mm²)

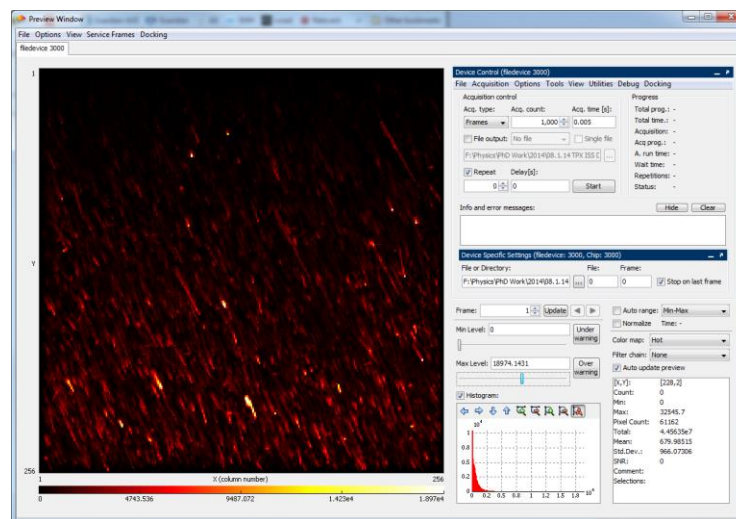
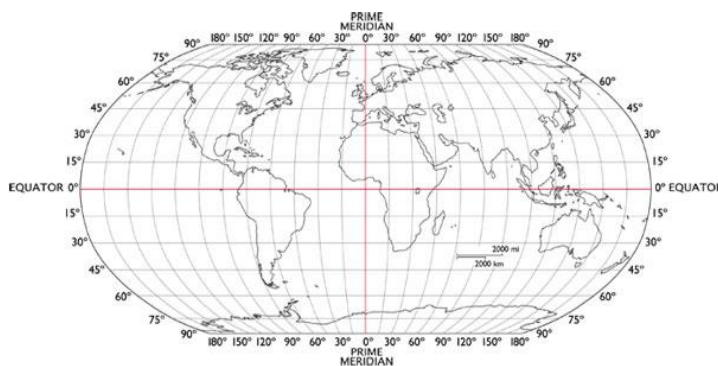
Pinholes in lead
collimator



Future Work

▶ Not related to BrachyView:

- Assisting ESR 7 with data analysis taken from ISS
- Obtaining detector calibration and looking at particle fluence as a function of orbit position and time
- Currently in progress



Road Map 2015

- ▶ Finalise PhD thesis (and graduate!!!)
- ▶ Prototype a fully functional BrachyView probe and continue collaborations with medical centres



Memorial Sloan Kettering
Cancer Center.

- ▶ Refine source localisation process (software and hardware developments)
- ▶ Train other students in the use of Medipix and fundamentals of radiation detection and protection using semiconductor devices
 - Educational tool
 - Undergraduate, Masters students (CMRP, UOW)
- ▶ Obtain experience in fields outside medical imaging (e.g. working with ESR 7)



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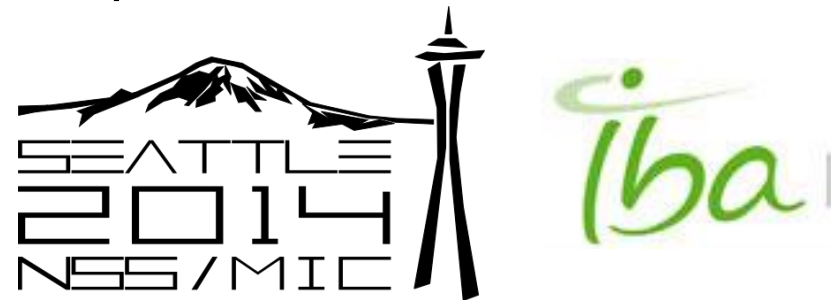


Conferences, Training, Secondments

- ▶ ARDENT Business and Administration: 19–23 May, 2014
- ▶ CMRP, UOW: 7 June – 8 July, 2014



- ▶ ***FUTURE***
- ▶ IEEE NSS–MIC: 8 – 15 November, 2014
[‘Image quality in adaptive and multimodality imaging’ short course]
- ▶ Business and Administration internship: early 2015, IBA Dosimetry



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THANK YOU!