Spectrum Measurement Using Medipix3 In Charge Summing Mode

Robert Doesburg[1], Thomas König[2], Syen Nik[1], Stephen Bell[1,3], Paul Ronaldson[3], Michael Walsh[3], Anthony Butler[3], Phil Butler[1]

[1] Department of Physics and Astronomy, University of Canterbury, Christchurch, New Zealand
[2] German Cancer Research Center (DKFZ), Im Neuenheimer Feld 280, 69120 Heidelberg, Germany
[3] Centre of Bioengineering, University of Otago Christchurch, Christchurch, New Zealand

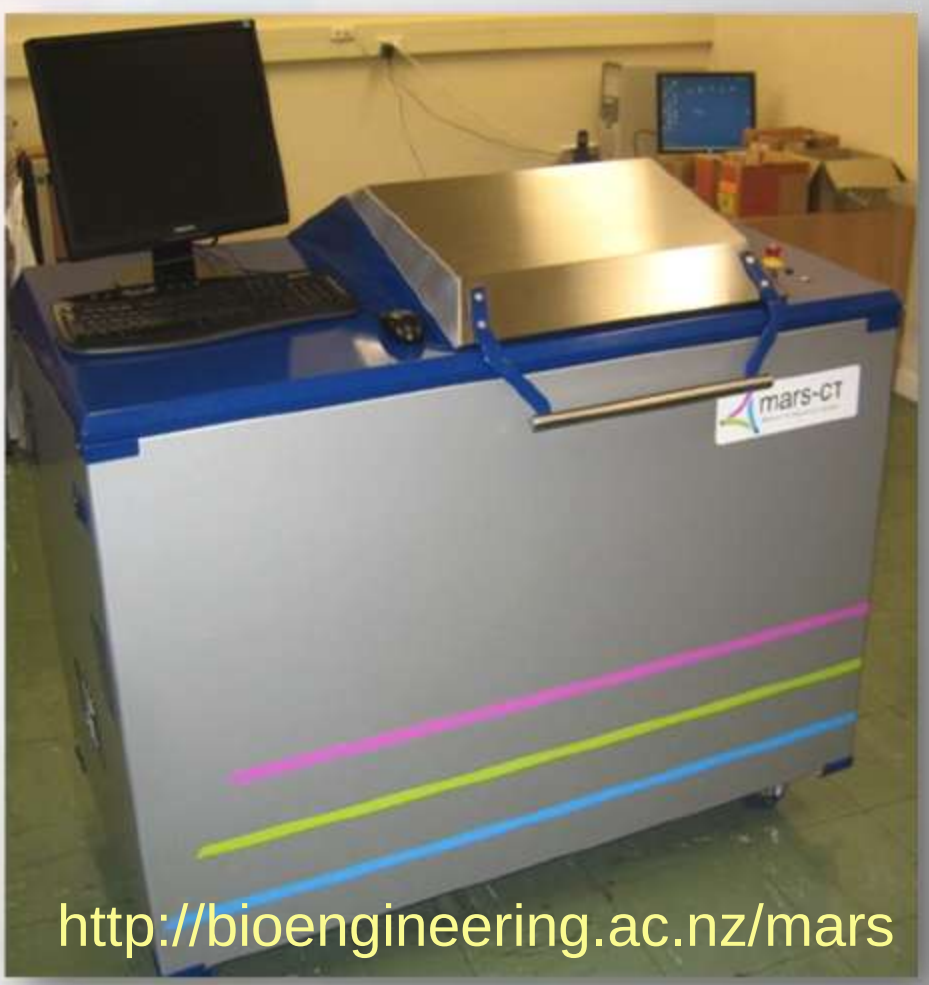
International Workshop On Radiation Imaging Detectors, 1-5th July 2012

The Team

- Technical team
  - University of Canterbury
- Clinical team
  - University of Otago
- International Partners
  - Medipix3 collaboration
  - Virginia Tech, Mayo Clinic

MARS-microCT

- Rotating gantry, fixed specimen
  - Fully shielded cabinet
  - Large rat or small rabbit
- Software
  - Low level C library
  - High level via python classes



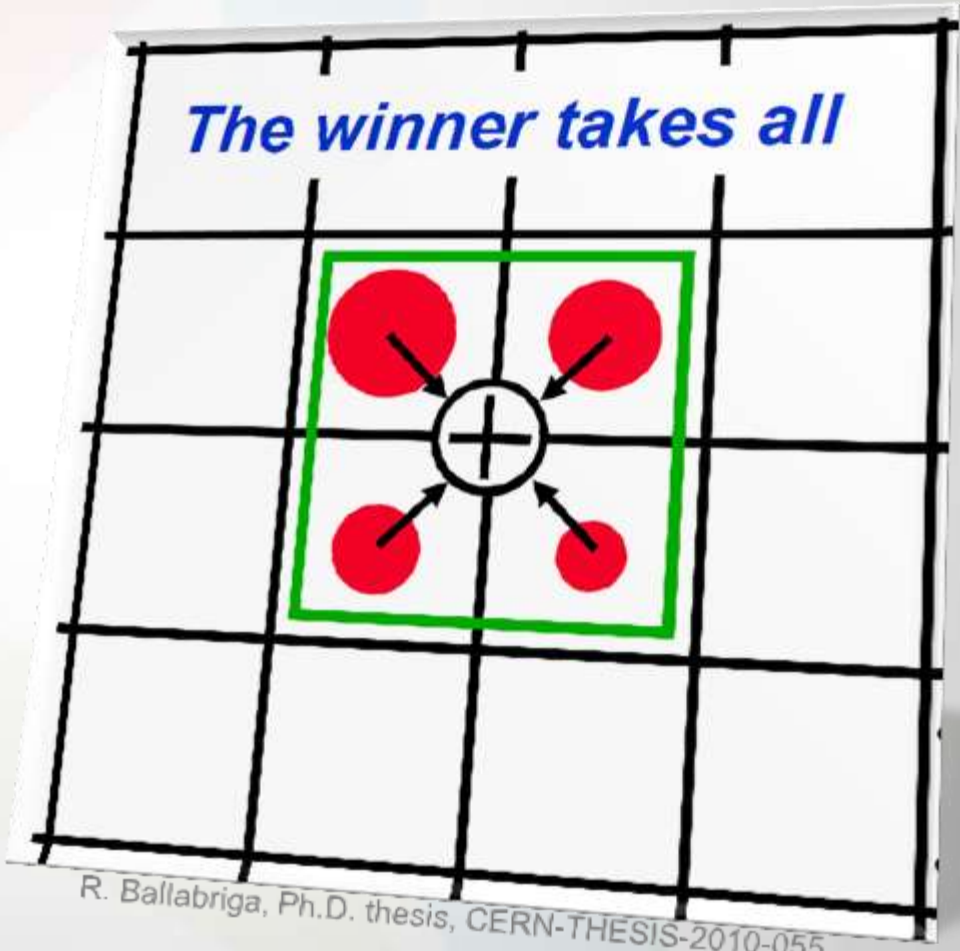
mars

Experiment apparatus

- 1mm CdTe
- Medipix3.0 ASIC
- 1 chip out of 2x3 array

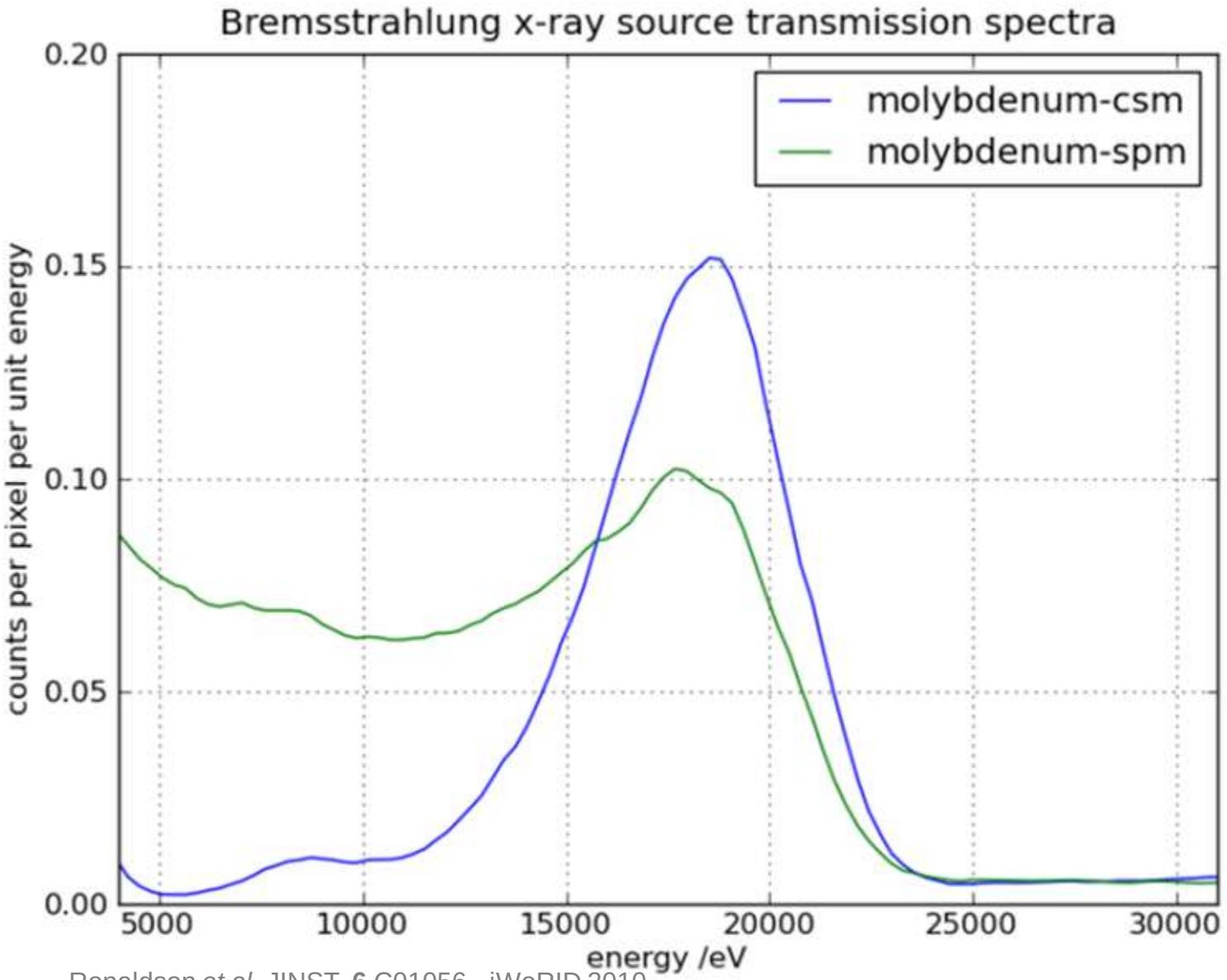
Charge Summing Mode

- Medipix3 can operate in *Charge Summing Mode*
  - Eliminate charge sharing effect
  - Pixels grouped into logical clusters of 4
  - Pixel size: 55*55 μm^2
  - Charge collection area: 110*110 μm^2



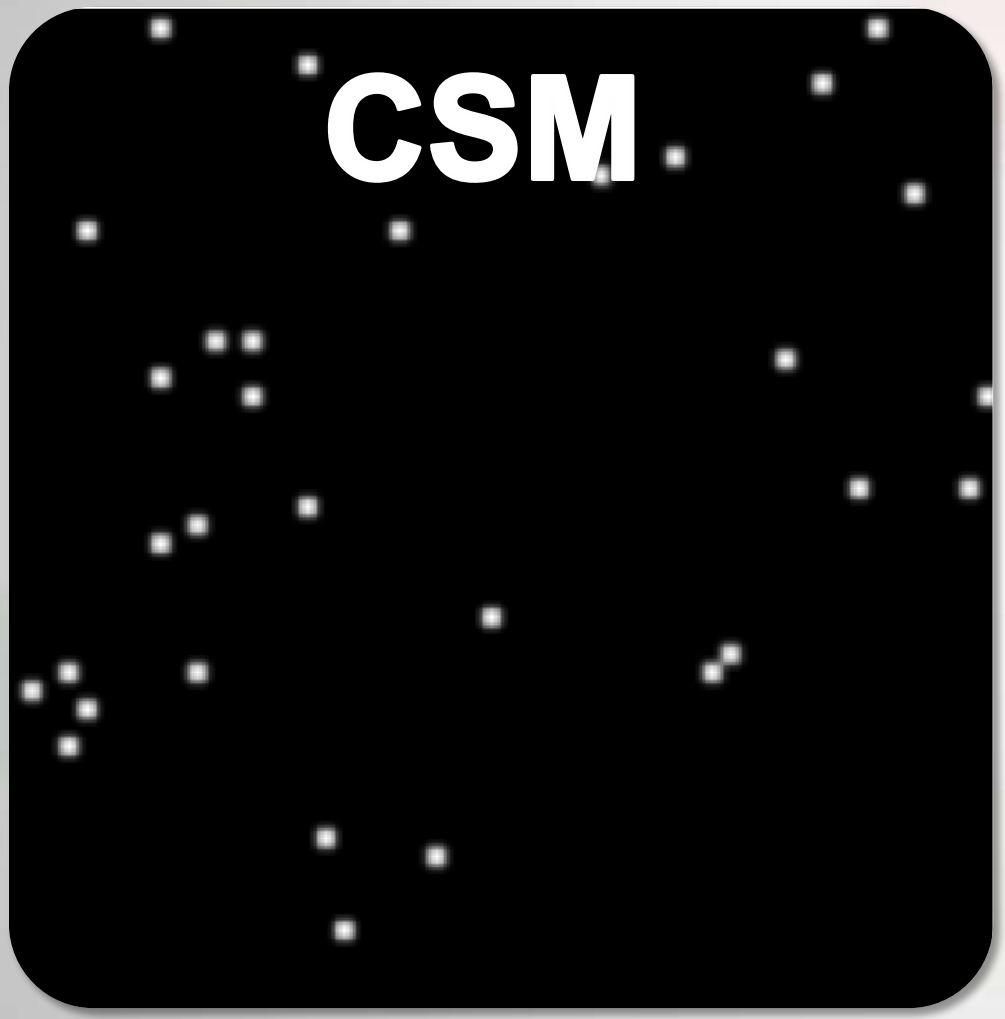
R. Ballabriga, Ph.D. thesis, CERN-THESIS-2010-055

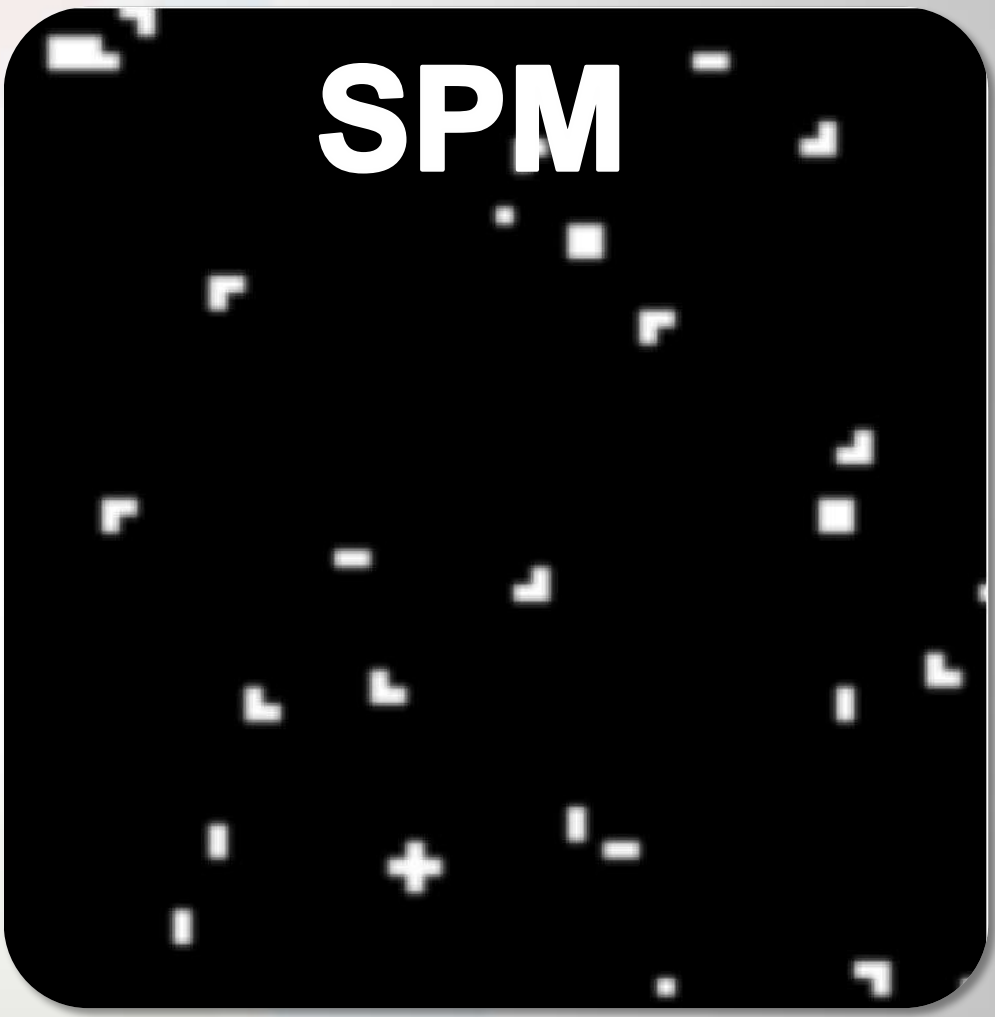
Charge Summing Mode (Si)



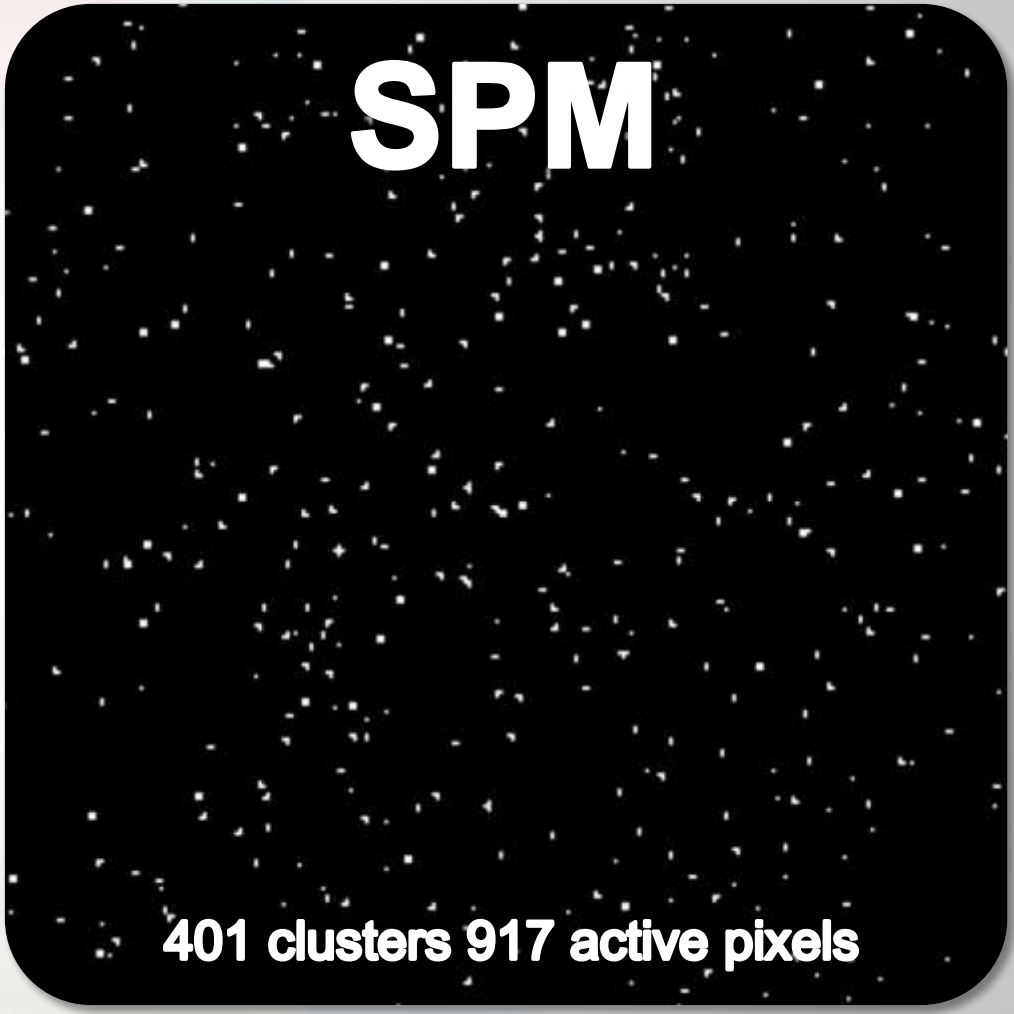
Ronaldson *et al*. JINST, **6** C01056 - iWoRID 2010

Charge Summing Mode (Si)

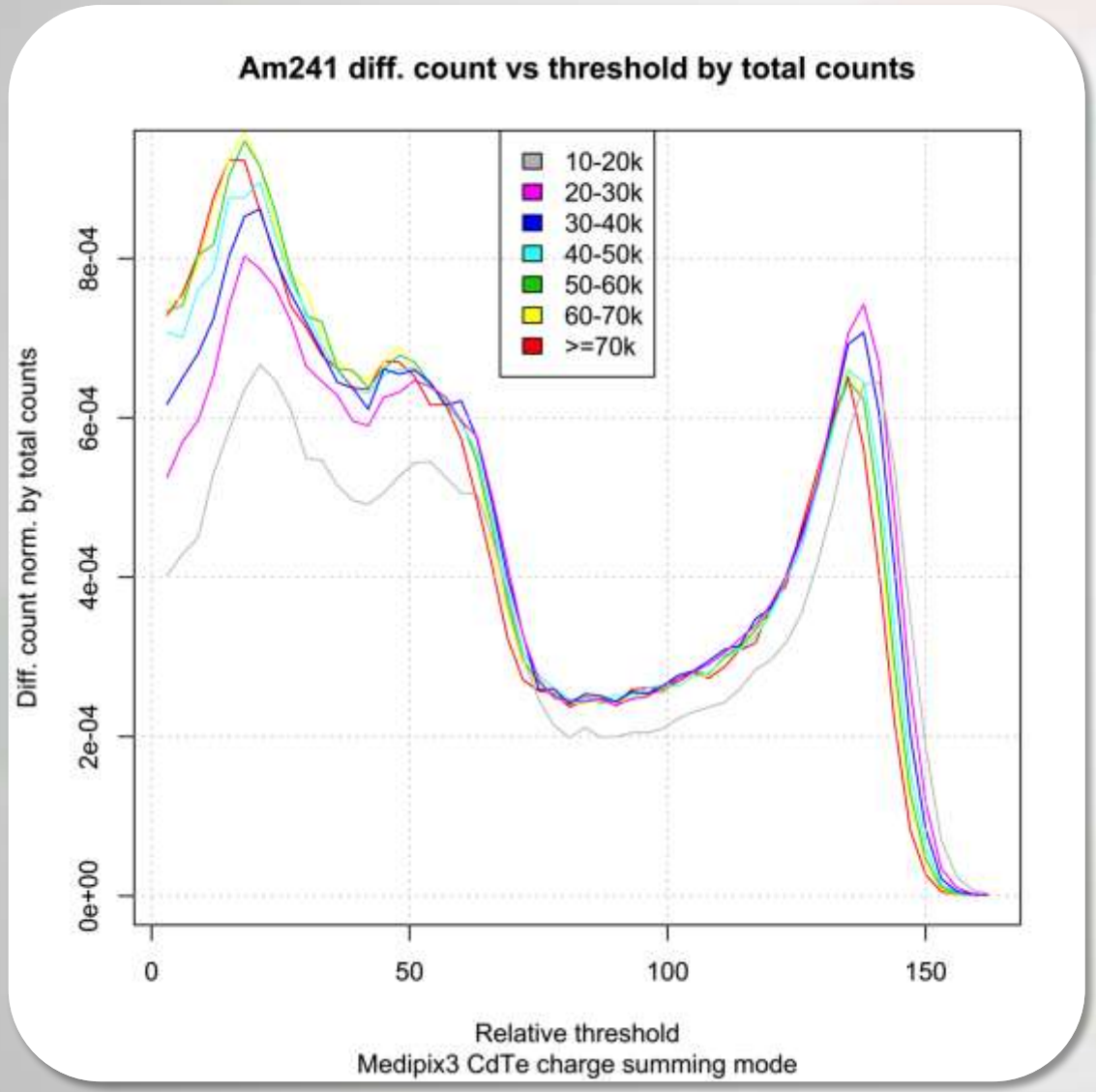




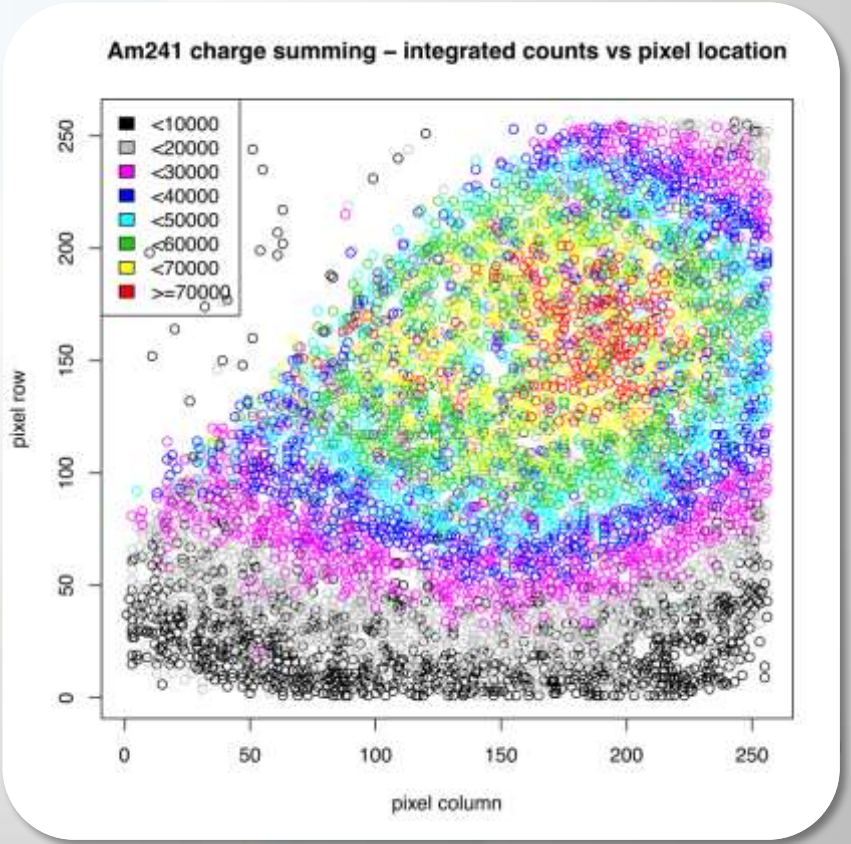
Charge Summing Mode (Si)



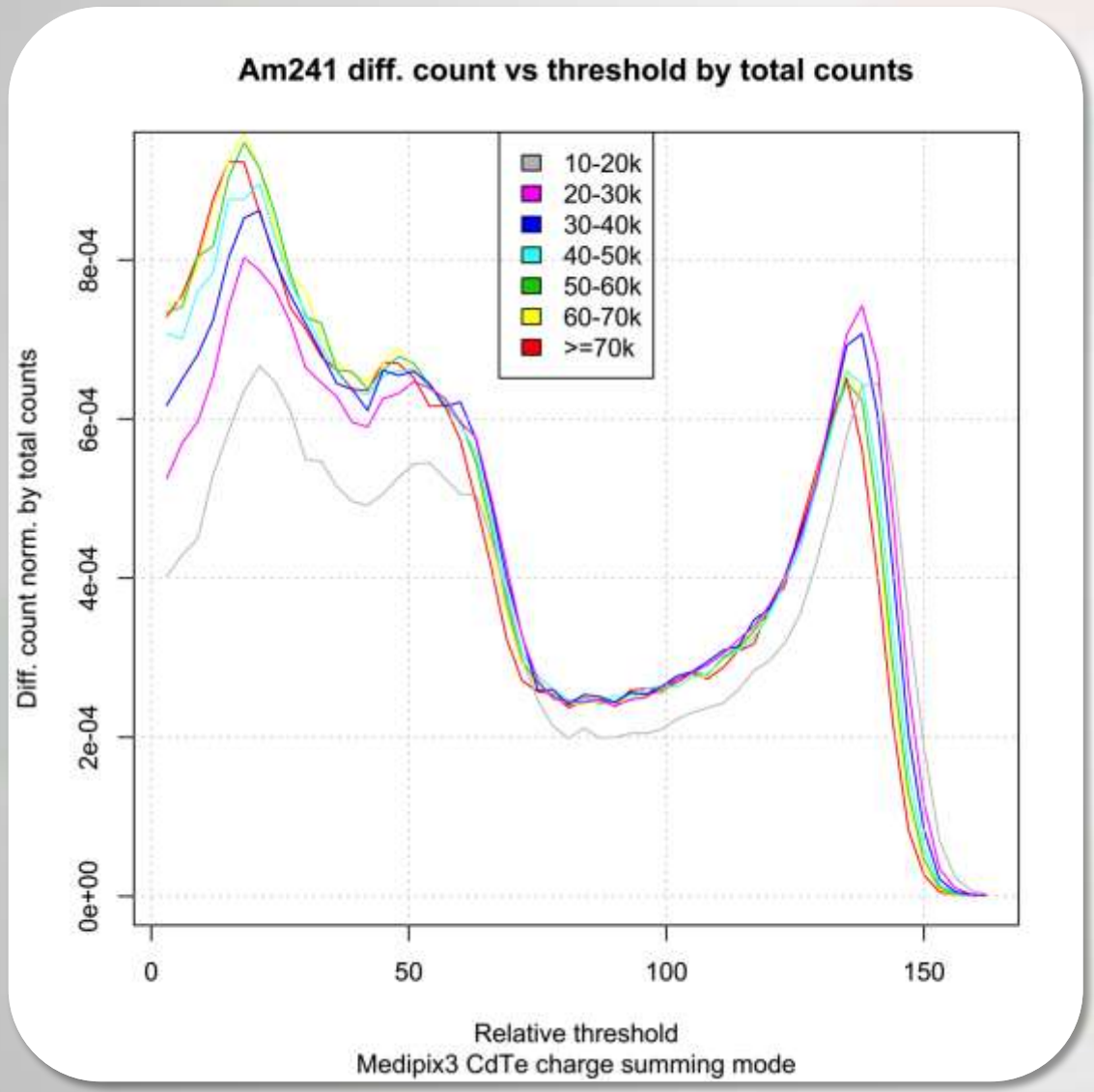
Charge Summing Mode (CdTe)



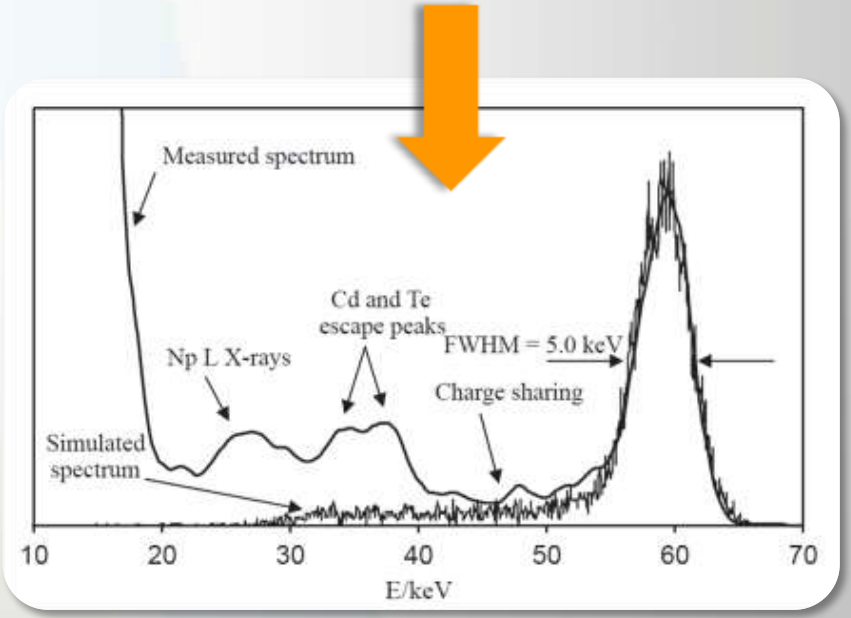
- Pixels grouped according to intensity
- Aligned zero crossing point at upper tail



Charge Summing Mode (CdTe)



- Depicts Am-241 peak
- Possible Cd,Te escape peaks
- c.f. 0.25*0.50 mm^2 pixels



Spartoitis *et al*. NIMA **550** (2005) 267

Summary

- Medipix3.0 charge summing with removes considerable charge sharing
  - Am-241 59.5keV gamma 
  - Cd,Te escape peaks 
- Follow up using synchrotron at Karlsruhe Institute of Technology (KIT)

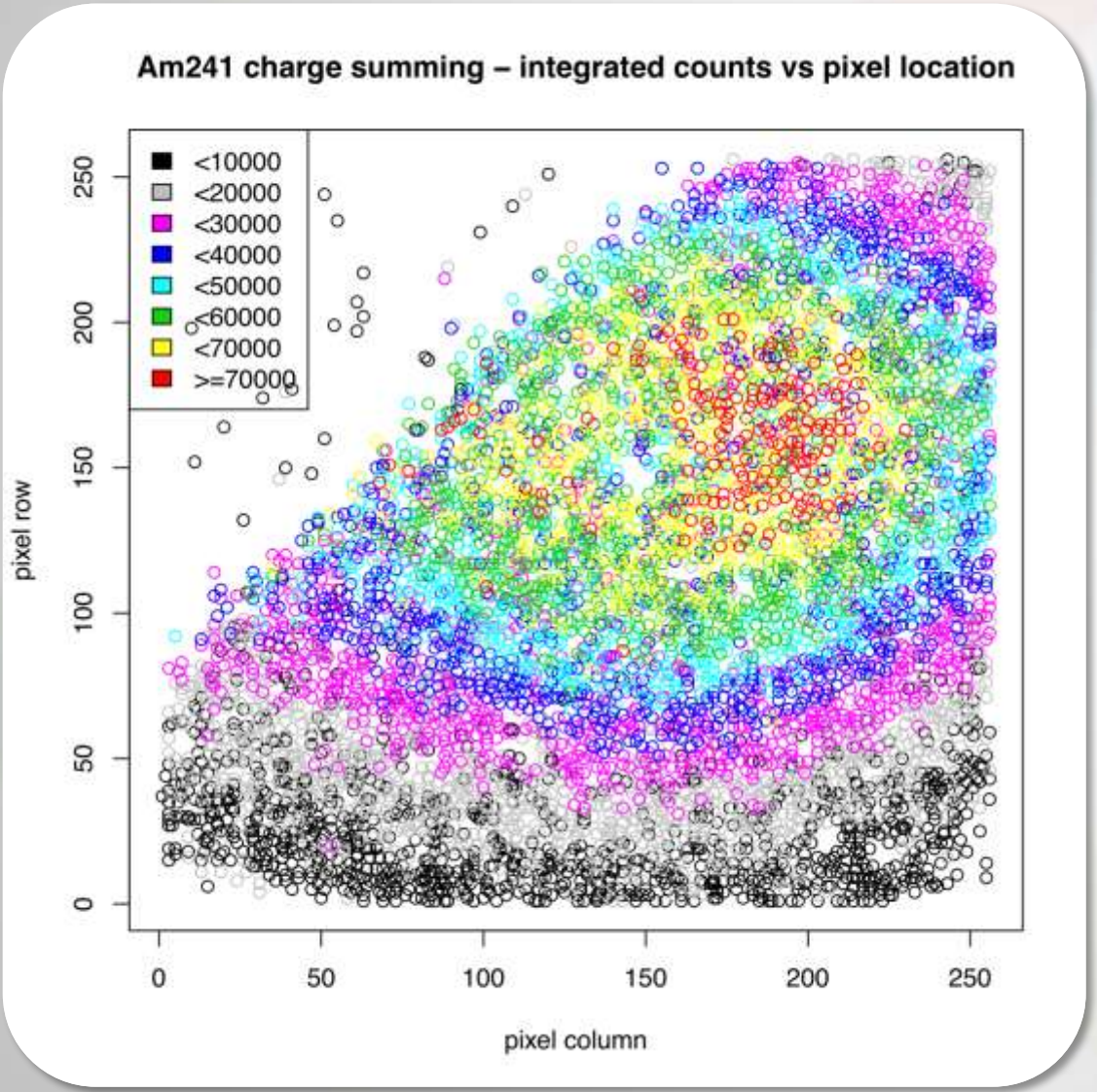
Thank you for your attention

Summary

- Medipix3.0 charge summing with removes considerable charge sharing
  - Am-241 59.5keV gamma 
  - Cd,Te escape peaks 
- Follow up using synchrotron at Karlsruhe Institute of Technology (KIT)

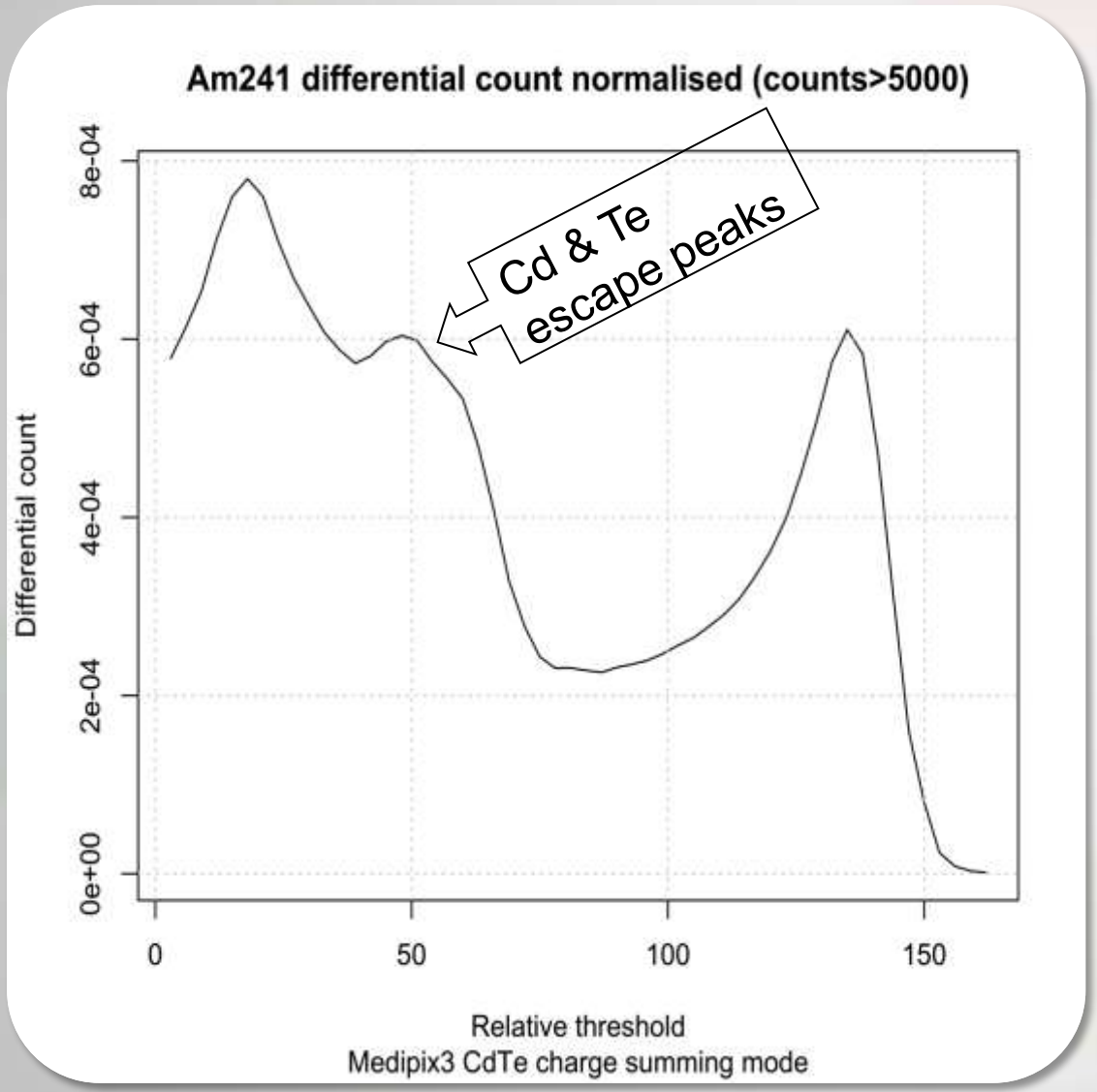
Thank you for your attention

Charge Summing Mode (CdTe)

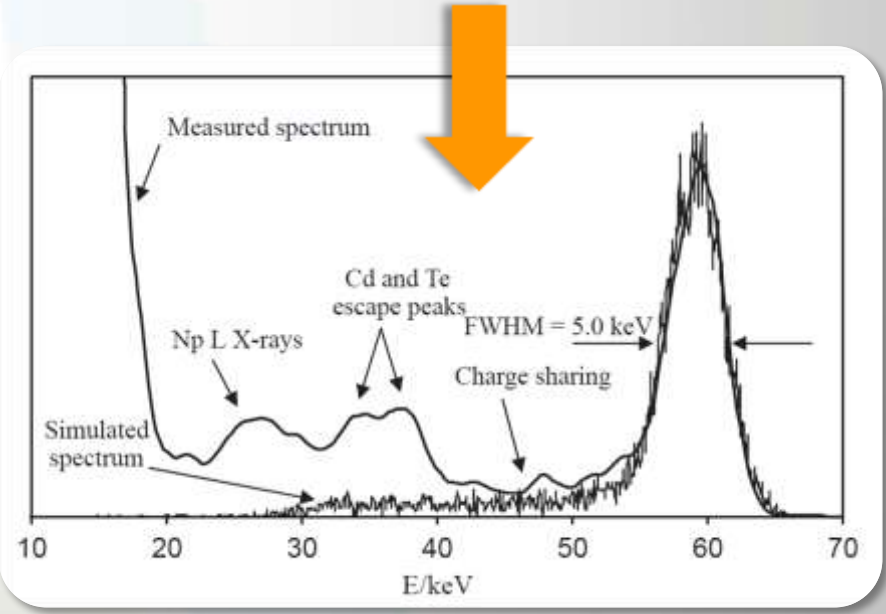


- 1mm CdTe
- Am-241, 1.7GBq
- 4cm from detector
- 40 * 3s exposures
- No attempt to equalize, but post-processed
- ~ 6000 pixels

Charge Summing Mode (CdTe)

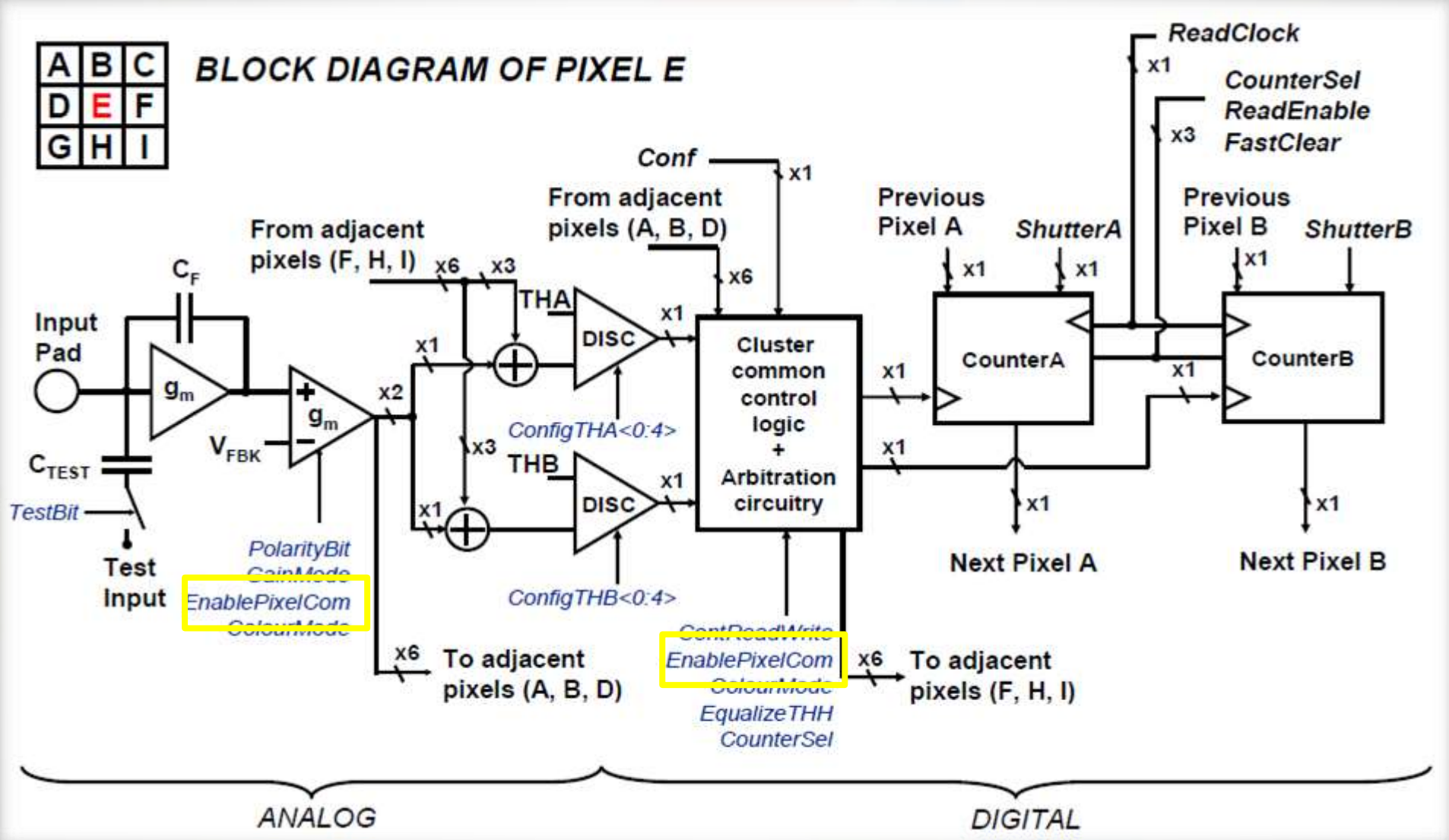


- Depicts Am-241 peak
- Possible Cd,Te escape and emission peaks
- c.f. 0.5*0.5 mm^2 pixels



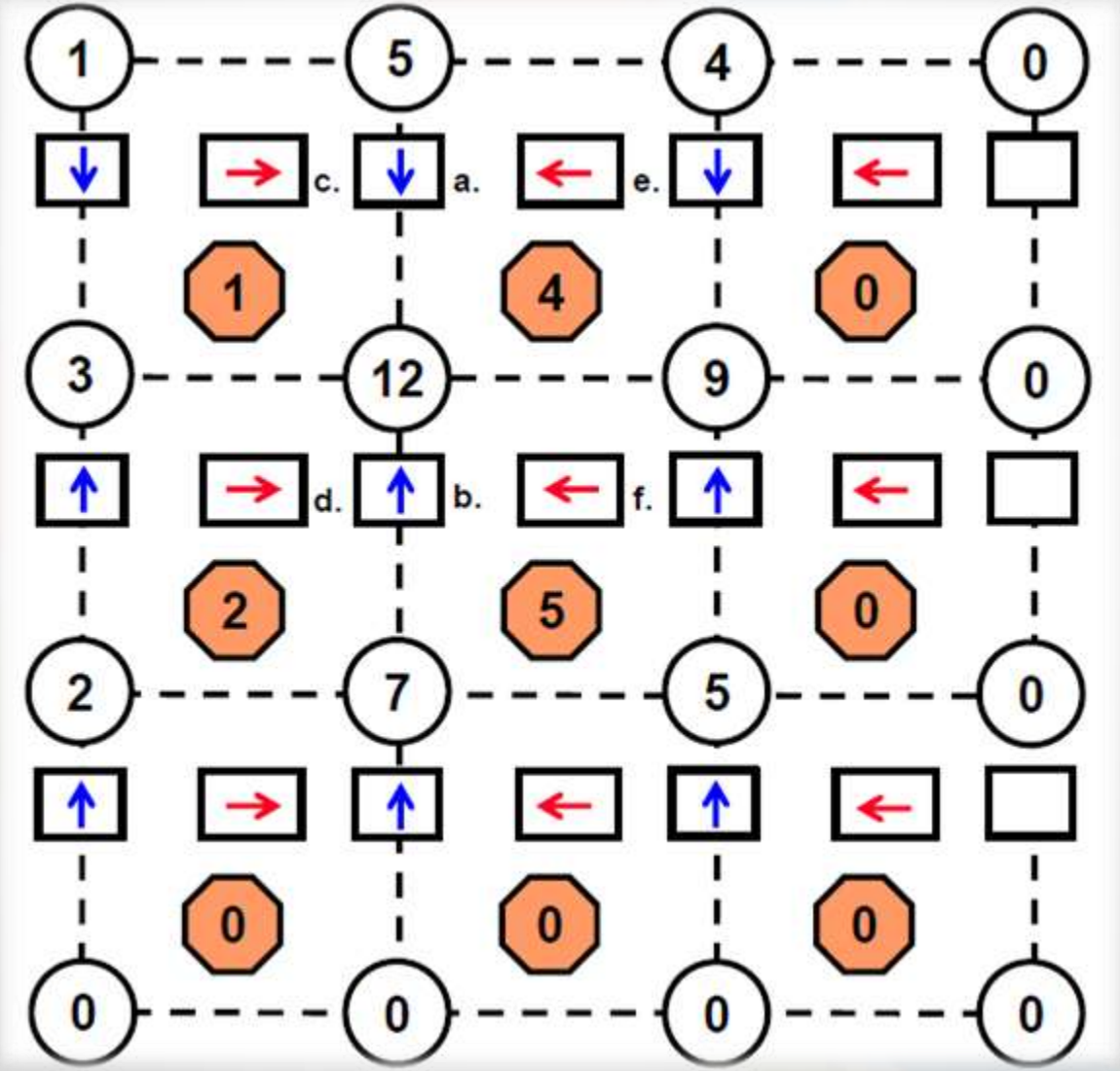
Spartoitis *et al*. NIMA **550** (2005) 267

My attempt to explain Medipix Charge Summing Mode



R. Ballabriga, Ph.D. thesis, CERN-THESIS-2010-055

My attempt to explain Medipix Charge Summing Mode



R. Ballabriga, Ph.D. thesis, CERN-THESIS-2010-055