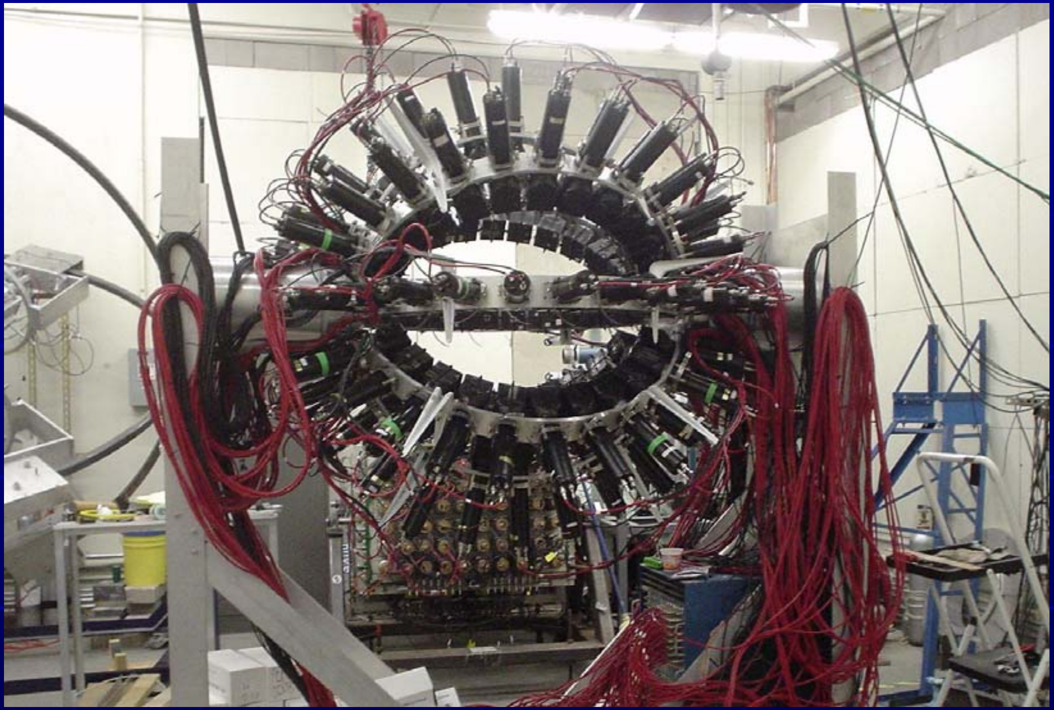
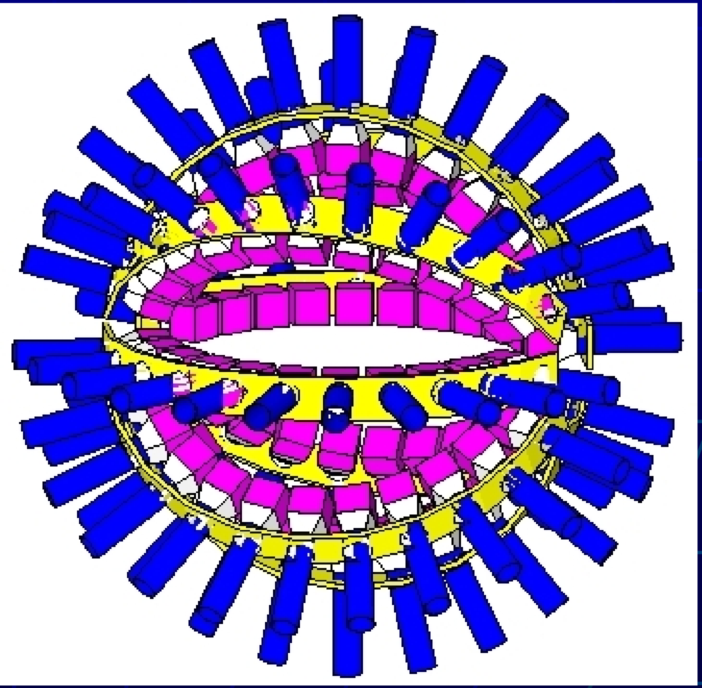
Blowfish Update





GEANT4

Cells

- Phototubes/bases upgraded 2003
- Problem cells
  - need inspection – tube replacement?
- No spares
  - Trying to duplicate fabrication process in Saskatoon
  - Glue needs to be unaffected by Tri-methyl benzene (Solvent in BC505)

Electronics

- FASTBUS ADCs and TDCs replaced by VME
- Trigger electronics
  - works – but...
  - needs a thorough checkout after long downtime
  - could be “cleaned up”
- Needs 1 additional VME trigger module

Data Acquisition System

- Front-End processor ported to PC running RTEMS
  - Fibre optic link to VME
  - 20X increase in maximum data rate
- LUCID
  - Ported to Linux
  - User interface ported to GTK (1.2 now 2.x)
  - Mature interface to Root (Ward Wurtz)
- DVD writer for data storage
- LUCID needs updating to recent Linux distribution

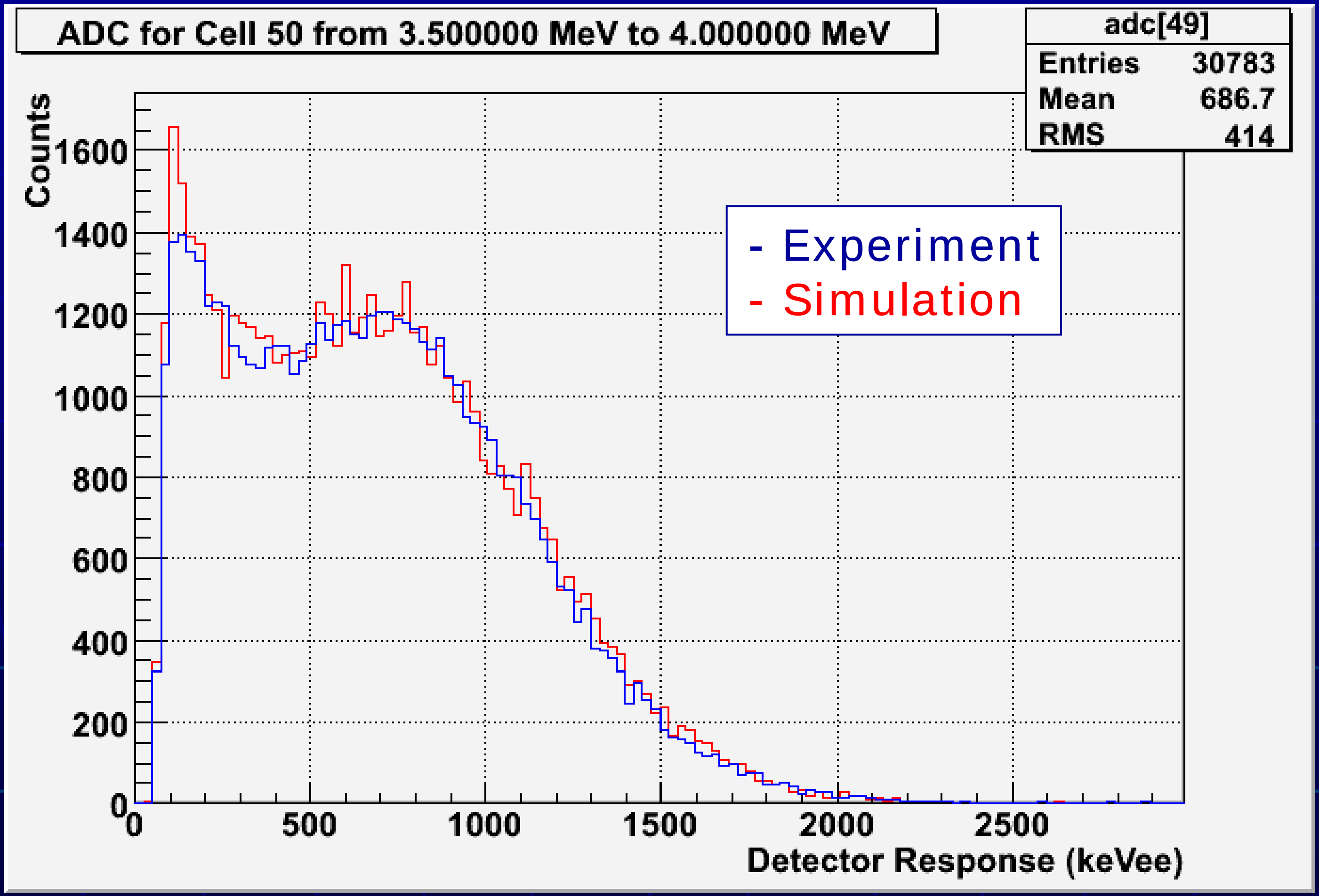
Gain Monitoring System

- Fibre optic based flasher system (Brian Bewer M.Sc.)
  - Stabilized against radioactive ^{137}Cs source with a GSO monitor detector
  - Installed, tested and used (Feb 2005)
  - Gain known to <1%
    - ⇒ efficiency known to < 0.5%

Cell Efficiencies

- BC-505 Light output parameters settled
  - NIMA 565 (2006) 725
- Efficiency Measurements using Cf recoil fission source (December 2005) Ward Wurtz
  - Neutron energy determined by time-of-flight
  - Good agreement of light output spectrum with GEANT4 simulation
  - Inconsistencies with several cells – suspect gain setting incorrect

Cell Efficiencies



Normalized by number of fission events

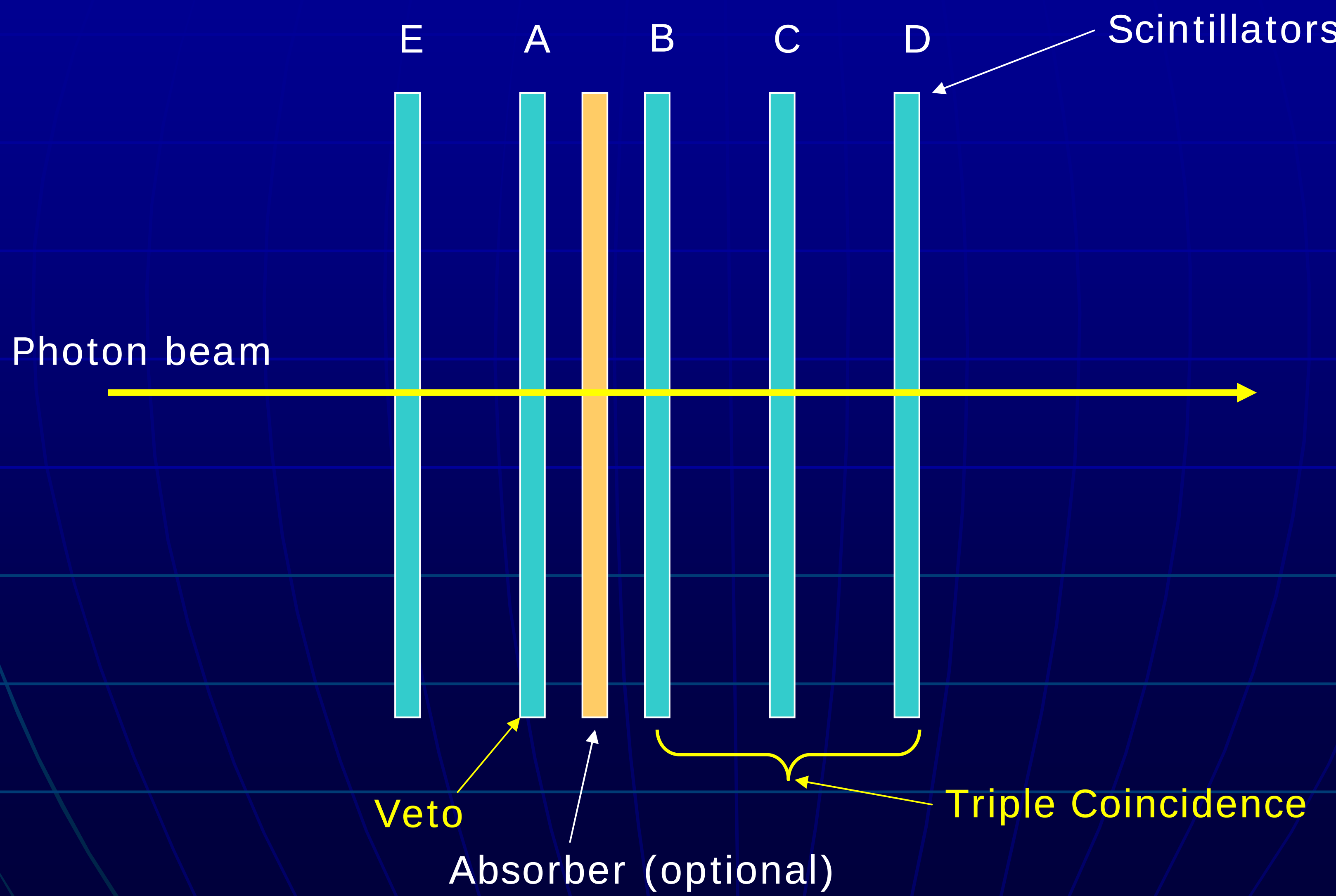
Targets

- ^{6}Li and ^{7}Li targets under construction
- Liquid ^{4}He target?
  - Cryostat needs to be identified
- Possible gas proportional counter active target design for ^{3}He & ^{4}He.
- Low density light pipe for active targets?
  - Not promising

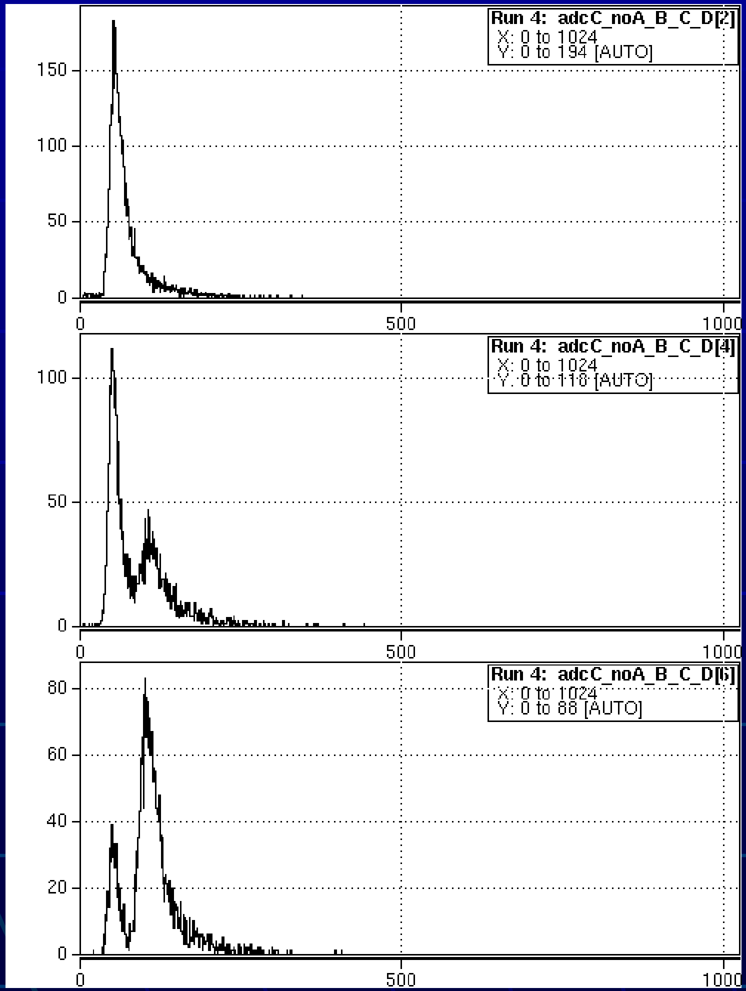
Photon Flux Monitor

- Goal
  - Stable continuous flux monitor
  - Insensitive to gain/threshold shifts
  - Relative intensity monitor
  - Can be used with a simple scalar
    - gated/ungated – no dead-time issues
- Secondary Goal
  - Absolute flux monitor
- GEANT4 Simulation

Photon Flux Monitor



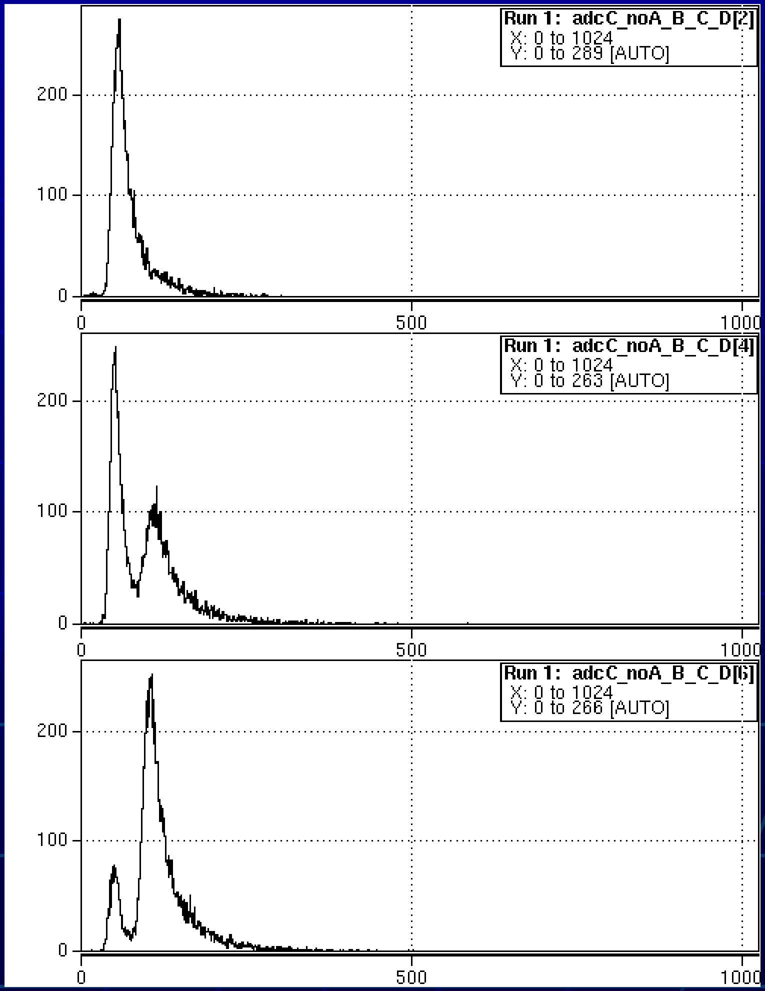
Photon Flux Monitor



5 MeV

20 MeV

100 MeV

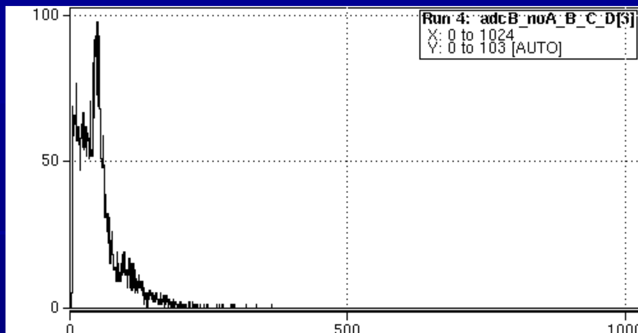


No Absorber

Al Absorber

Photon Flux Monitor

10 MeV



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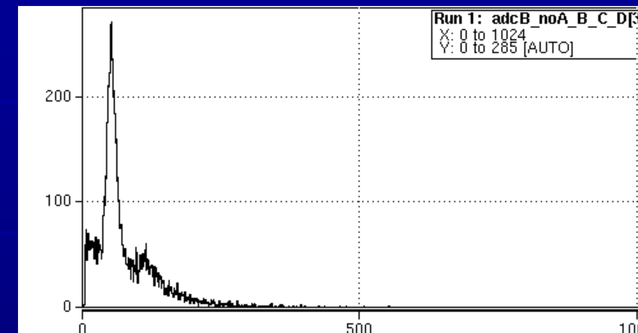

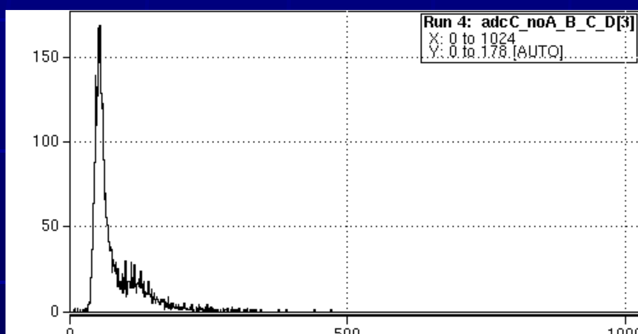

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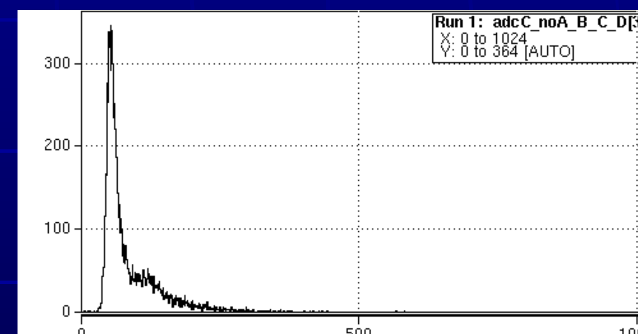
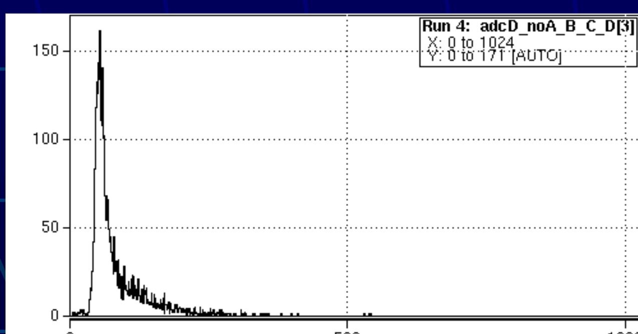
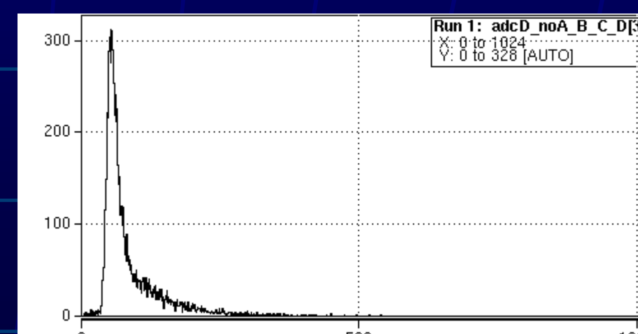




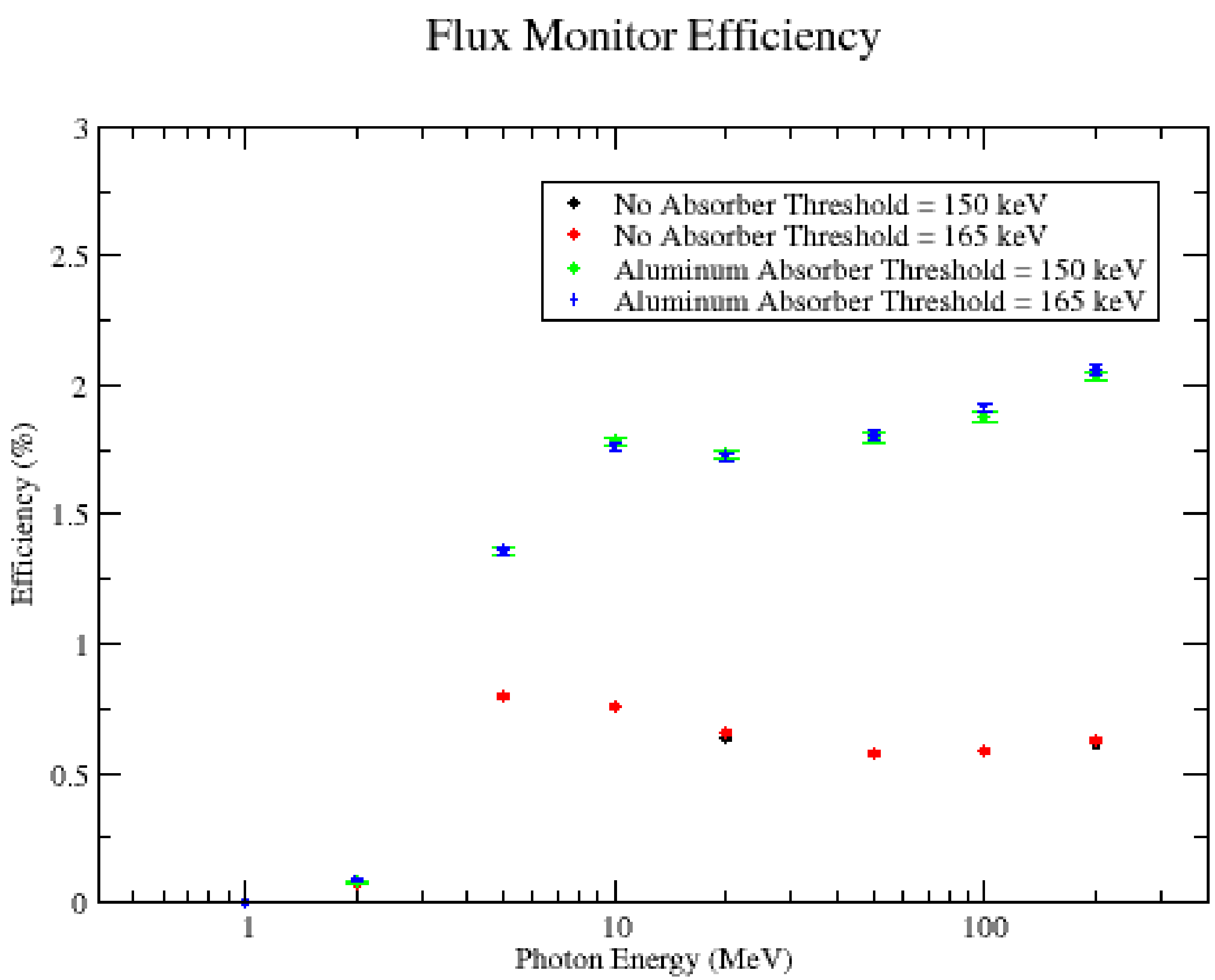
D



No Absorber

Al Absorber

Photon Flux Monitor



10% change in gain

⇒ 1.2% change in efficiency
No absorber

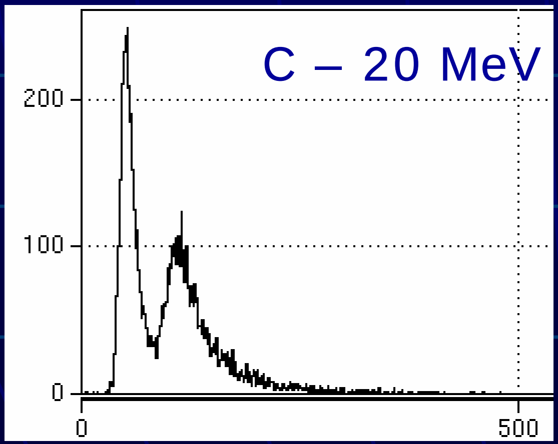
⇒ 0.4% change in efficiency
2 mm Al absorber

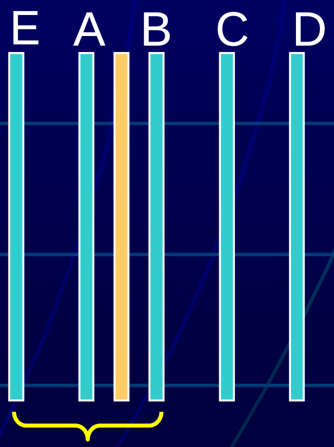
Absolute Flux Monitor

- How well do we need to know the parameters of the detector to predict efficiency from a Monte-Carlo calculation?
- Gains (thresholds)
- Geometry

Absolute Flux Monitor

- Gains (thresholds)
  - Can be determined from spectra
  - Efficiency can be made to be relatively insensitive to gain.
  - Veto gain (A) can be determined by using additional scintillator (E)





Absolute Flux Monitor

- Geometry
  - Scintillator width, spacing etc
    - Efficiency relatively insensitive to these
  - Scintillator thickness
    - No absorber:
      - Need thickness to 1% (0.03 mm for 3.175 mm thick scintillator (1/8")
    - 2 mm Al absorber:
      - Need thickness to 5% (0.15 mm for 3.175 mm thick scintillator (1/8")

Photon Flux Monitor

- Conclusions
  - Relative monitor
    - OK
  - Absoluter monitor
    - OK – needs refinement
      - choice of absorber, thicknesses, geometry etc
  - for energies below ~5 MeV
    - more thought/refinement required