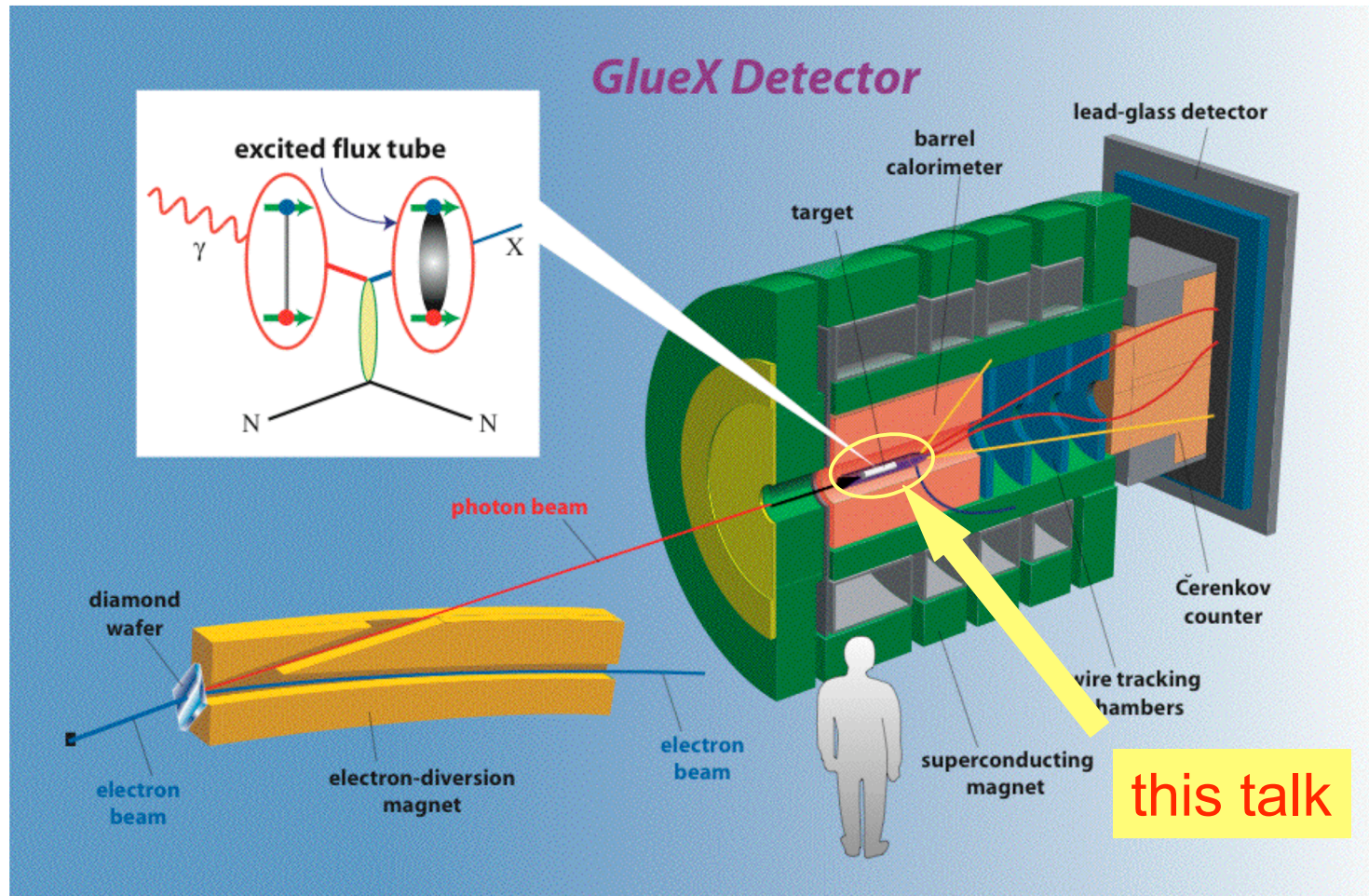# Start Counter
W. U. Boeglin

Detector Review

identification of the correct beam bucket in the final analysis. The committee was concerned that the benefits of using the start counter could easily be offset by negative aspects, like the start counter material (5mm of scintillator) causing multiple scattering and (occasional) particle conversion in front of the tracking system.

> *Recommendation:* Make sure that the start counter has an essential role for triggering or event analysis. If it does not, then remove it; if it does, then look into a substantial reduction of the scintillator thickness.

New Functionality

- helps initial phase of experiment
- start signal for tracking detectors
- will be removed for high luminosity running

Performance Requirements

- time jitter < ±3 ns

- time resolution with tracking information: $\sigma \leq 0.5$ ns

- maximal solid angle coverage

Start Counter Design

- array of ~6 scintillators with bent ends

- light guides to low field region (< 2kG)

- read out by high field PMT
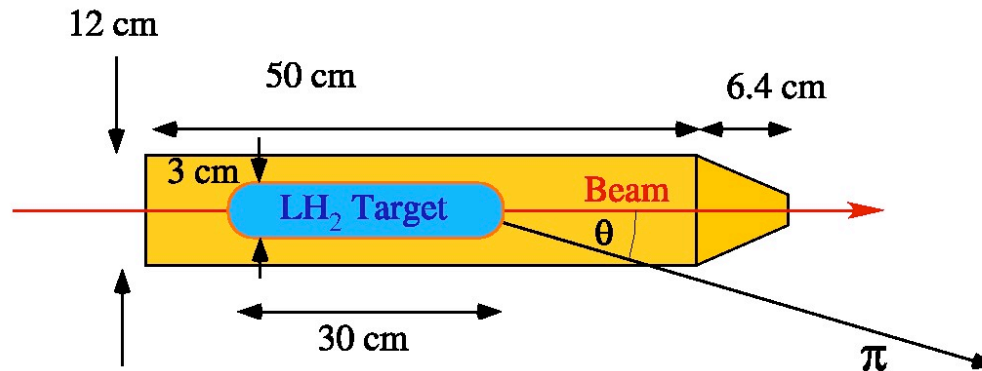
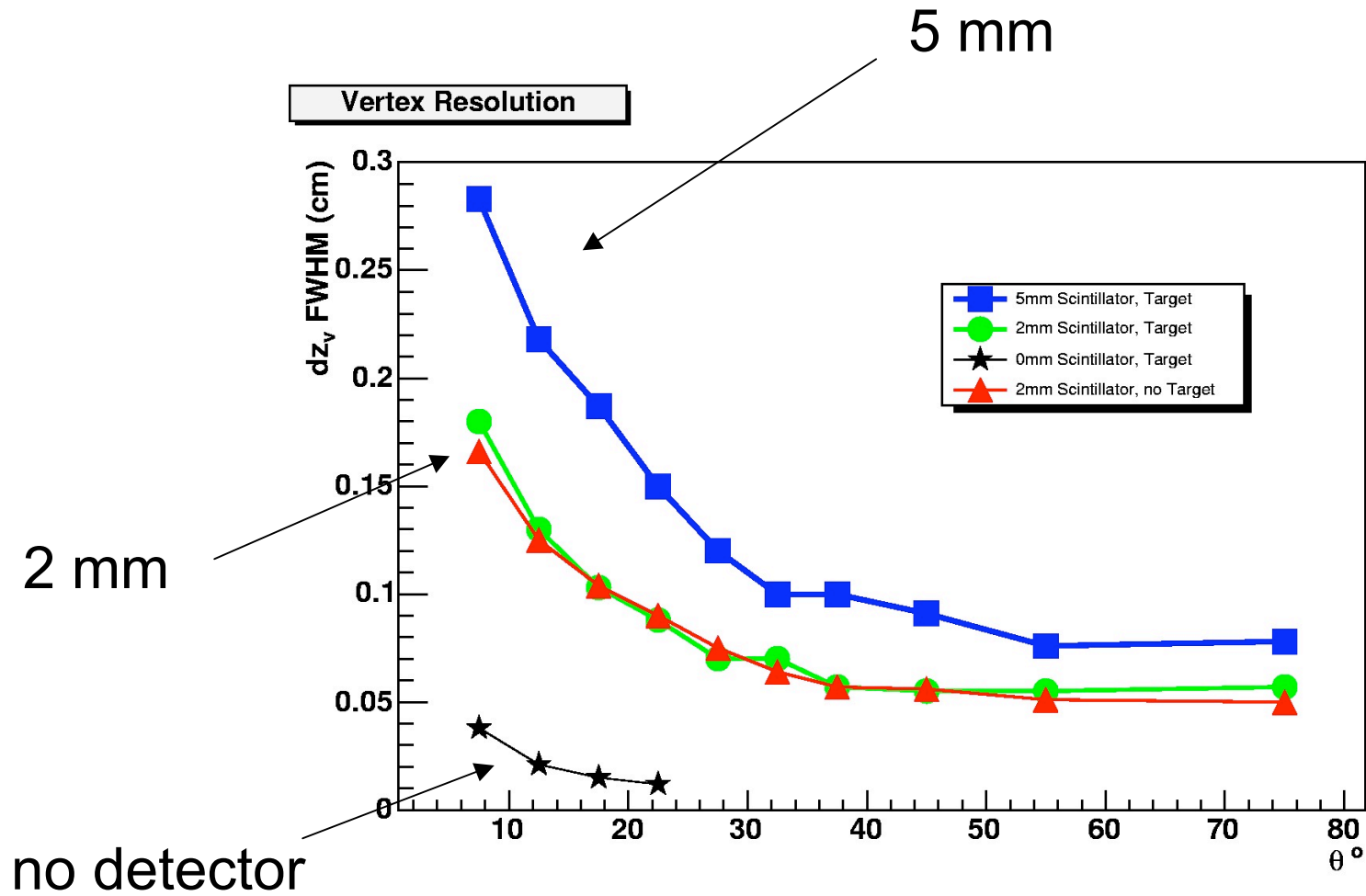- similar to a scaled down CLAS start counter

Readout

- H6614-70 system (Hamamatsu):
- gain 10^7
- photo cathode well matched to EJ200, 208 scintillator
- according to data sheet, practically no gain loss up to 2kG

  ➢ single ended readout
  ➢ time jitter due to light propagation ±2 ns
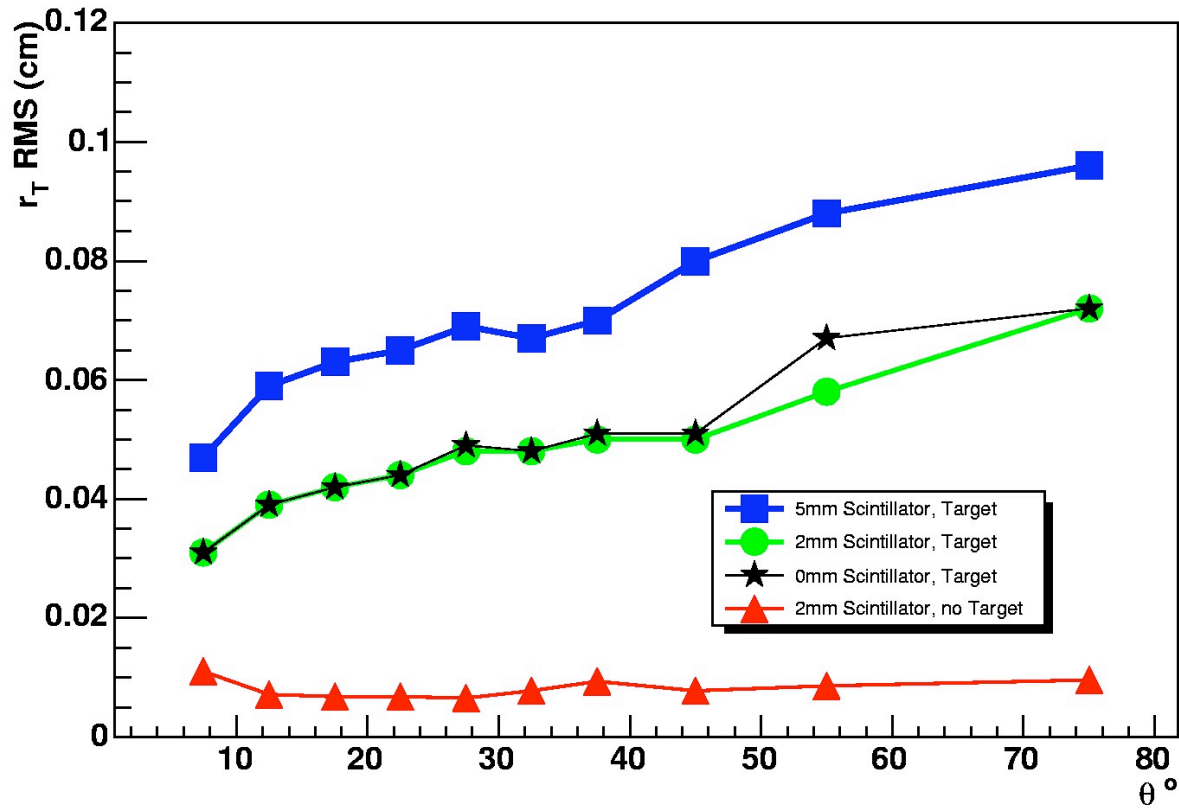
MC study of vertex resolution

(GlueX document 479)

- use 4π events from 9 GeV γ
- ignore magnetic field
- reconstruct vertex location from track after detector
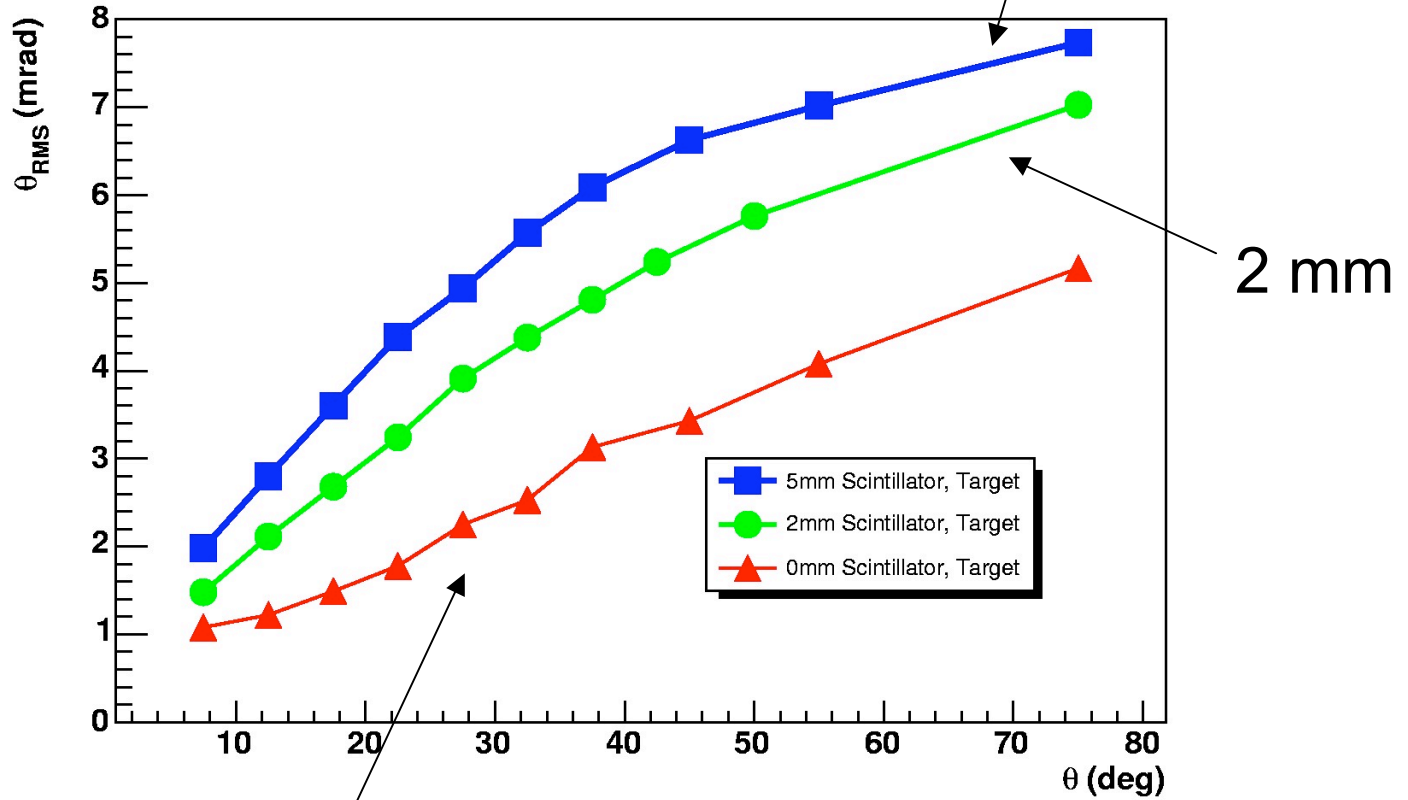- determine distribution of vertex location differences

5 mm

Vertex Resolution

2 mm

no detector

Legend:
- 5mm Scintillator, Target
- 2mm Scintillator, Target
- 0mm Scintillator, Target
- 2mm Scintillator, no Target

Y-axis: dz_v FWHM (cm)
X-axis: $\theta°$

Transverse Vertex Resolution

Legend:
- 5mm Scintillator, Target
- 2mm Scintillator, Target
- 0mm Scintillator, Target
- 2mm Scintillator, no Target

Y-axis: r_T RMS (cm)
X-axis: θ °

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Multiple Scattering RMS angle

5 mm

2 mm

no detector

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Conclusion

- scaled down version of start counter
  may be useful initially
- contributions to vertex resolution of a 2 mm
  detector seem acceptable
- detector can be built in a relatively short time
- much cheaper than large version (~ 30K)