Preliminary GEANT study of triplet polarimeter

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Polarimeter Monte Carlo

- Inner diameter: 48 mm
- Outer diameter: 96 mm
- Thickness: 1 mm
- Rings: 16 equally spaced
- Sectors: 16 sectors each spanning 22.5°
- Placed 48 mm downstream of the converter
- 10 million generated events using Richard's code
- Converter: 10^{-4} radiation length carbon
- Vertex smeared evenly through the converter in z-direction and evenly over a beam spot diameter of 5 mm in the xy-direction

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Polarimeter energy deposition multiplicities over 16 rings and 16 sectors

• 98% of energy deposition hits falls within a single sector

Full polarimeter

Rings

Sectors

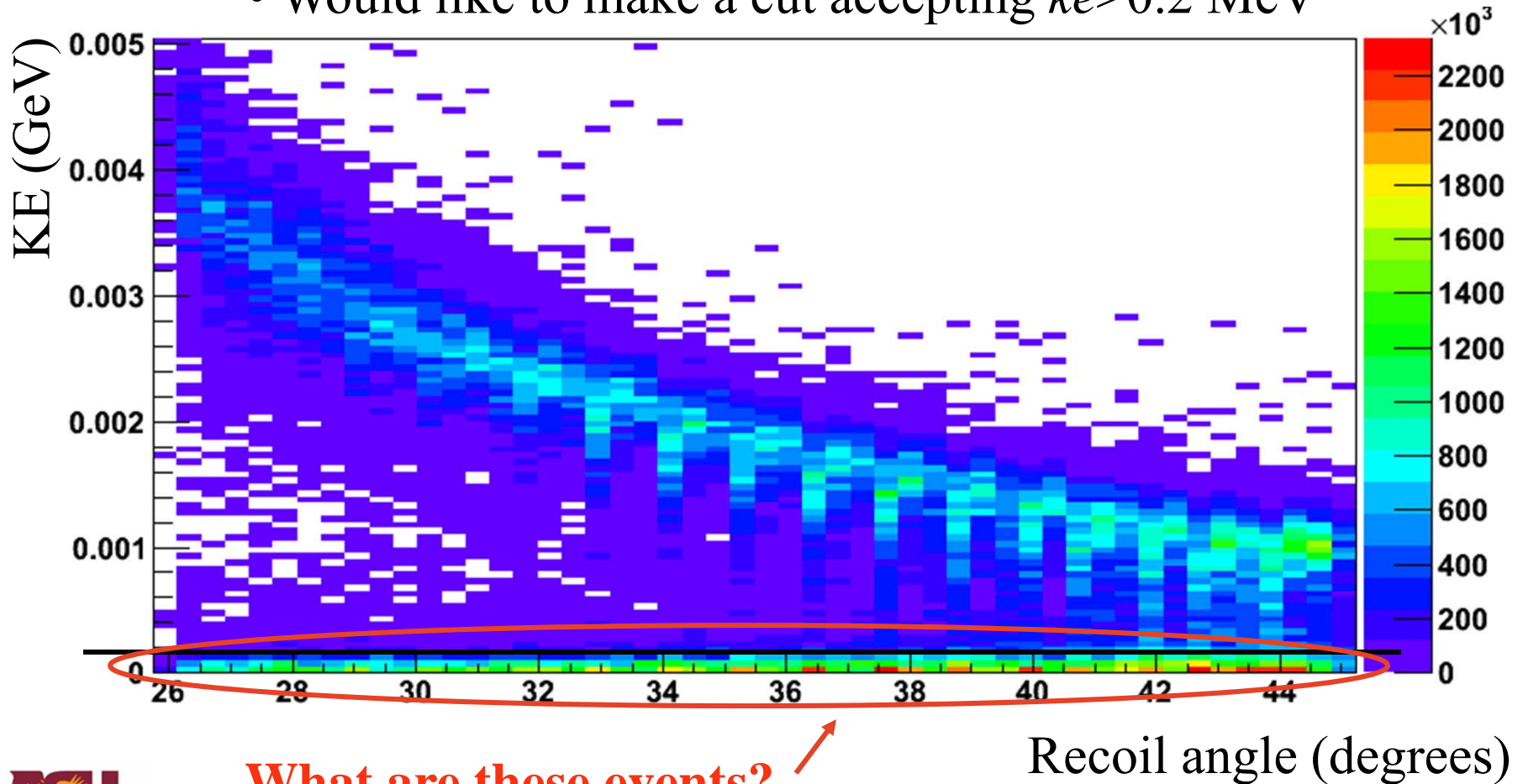Multiplicity

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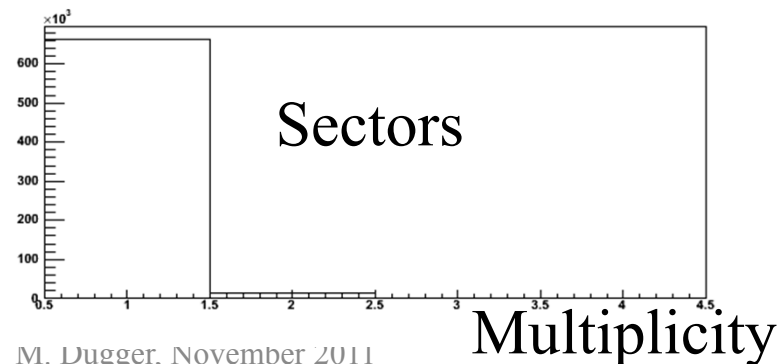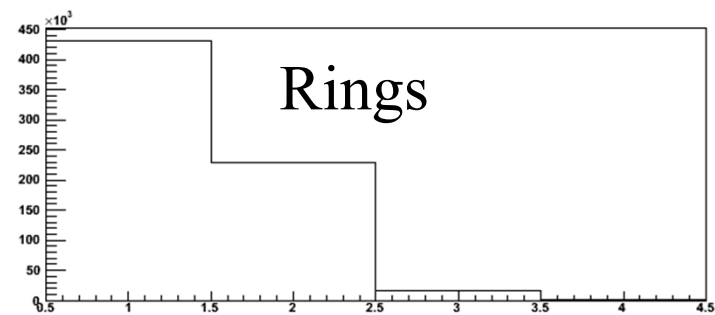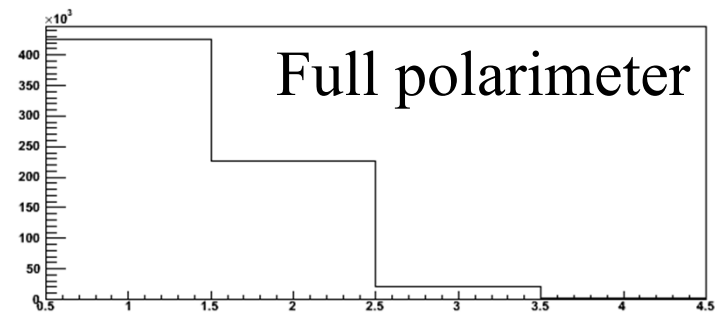
# Generated events with no losses in converter (with matched pairs: within 1 GeV)
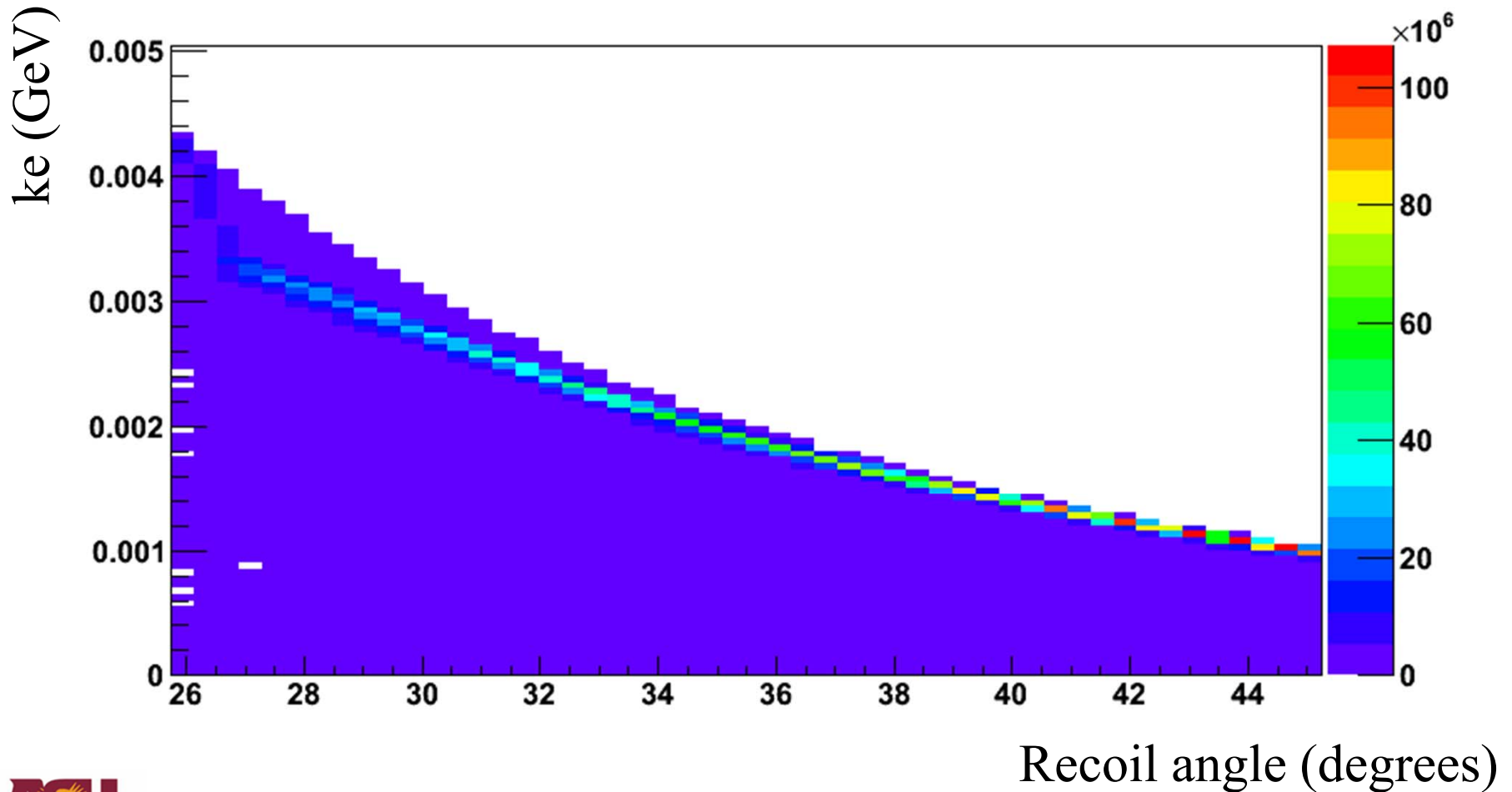
Generated events with energy losses in converter (carbon: 10^{-4} radiation lengths)

- Would like to make a cut accepting *ke*>0.2 MeV

What are these events?

Recoil angle (degrees)

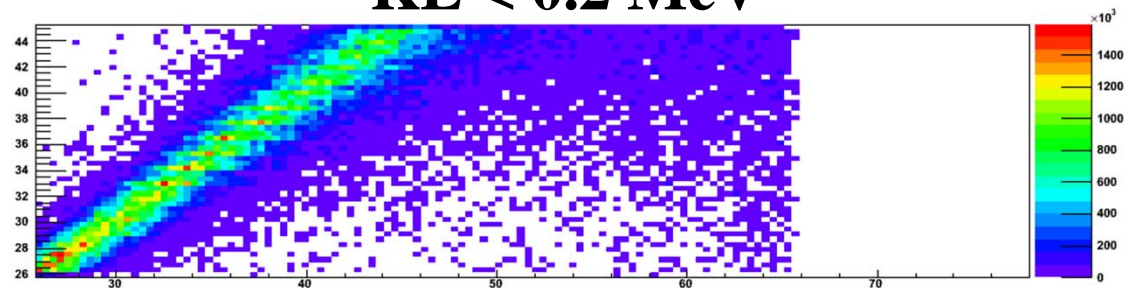# Recoil polar angle at polarimeter versus generated recoil angle

- θ_{R*} is recoil angle at the polarimeter

- θ_R is recoil from generator

- Events with KE < 0.2 GeV are from large generated angles that scatter to smaller angles when seen at the polarimeter
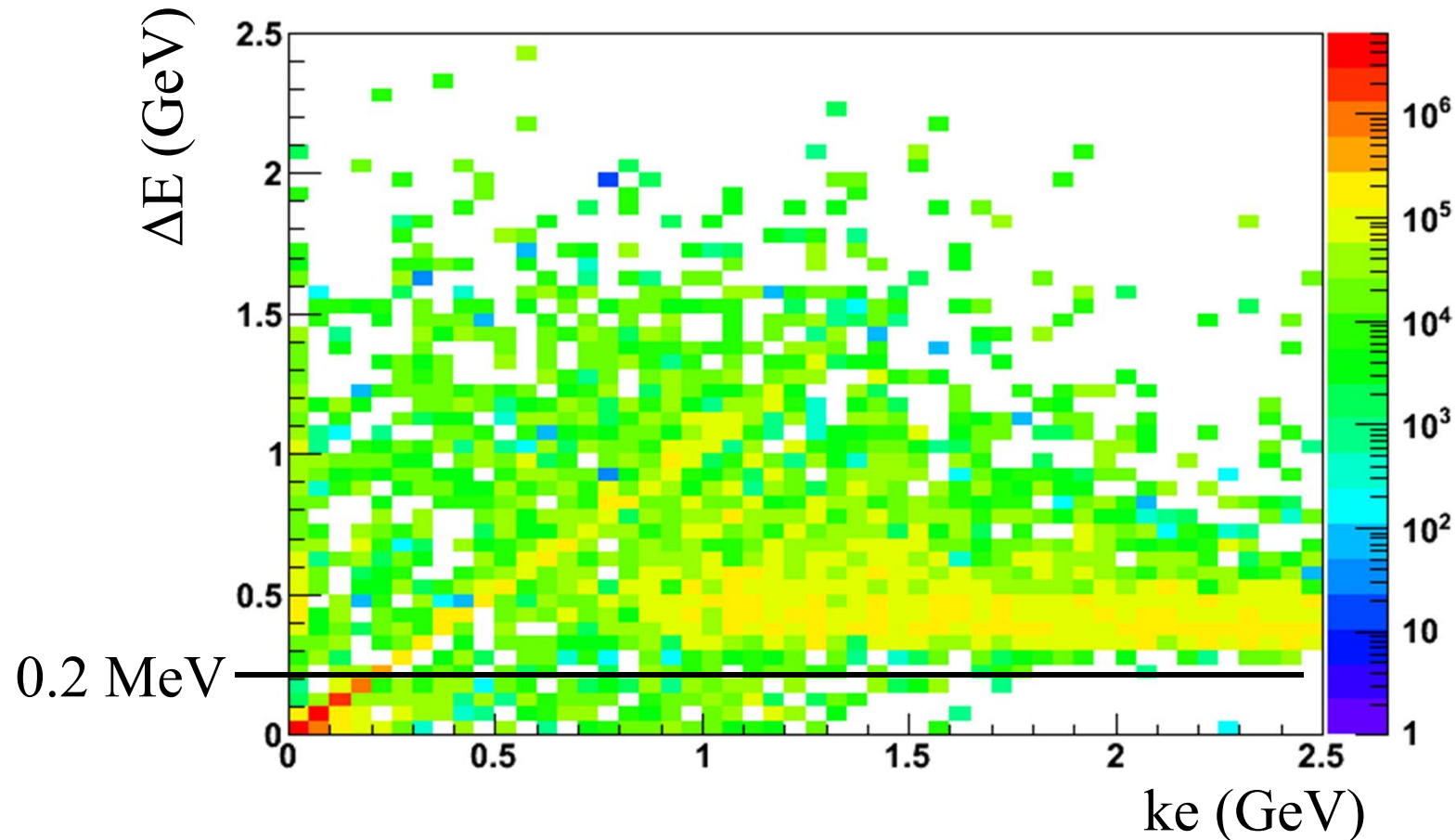
θ_{R*}
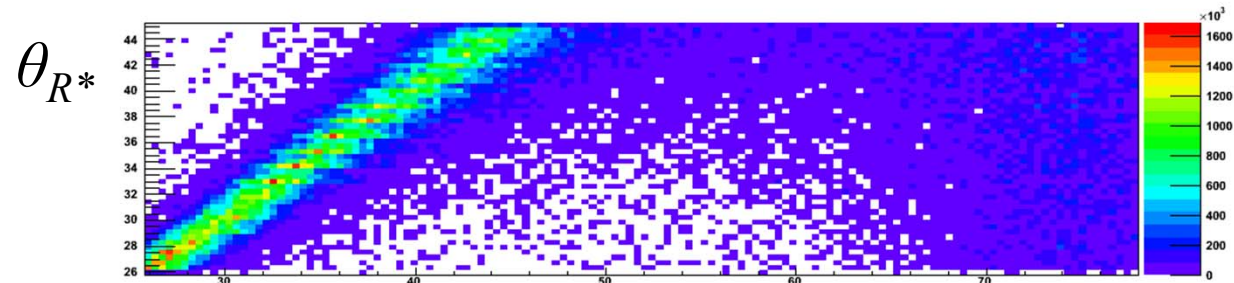
No KE restriction

KE < 0.2 MeV
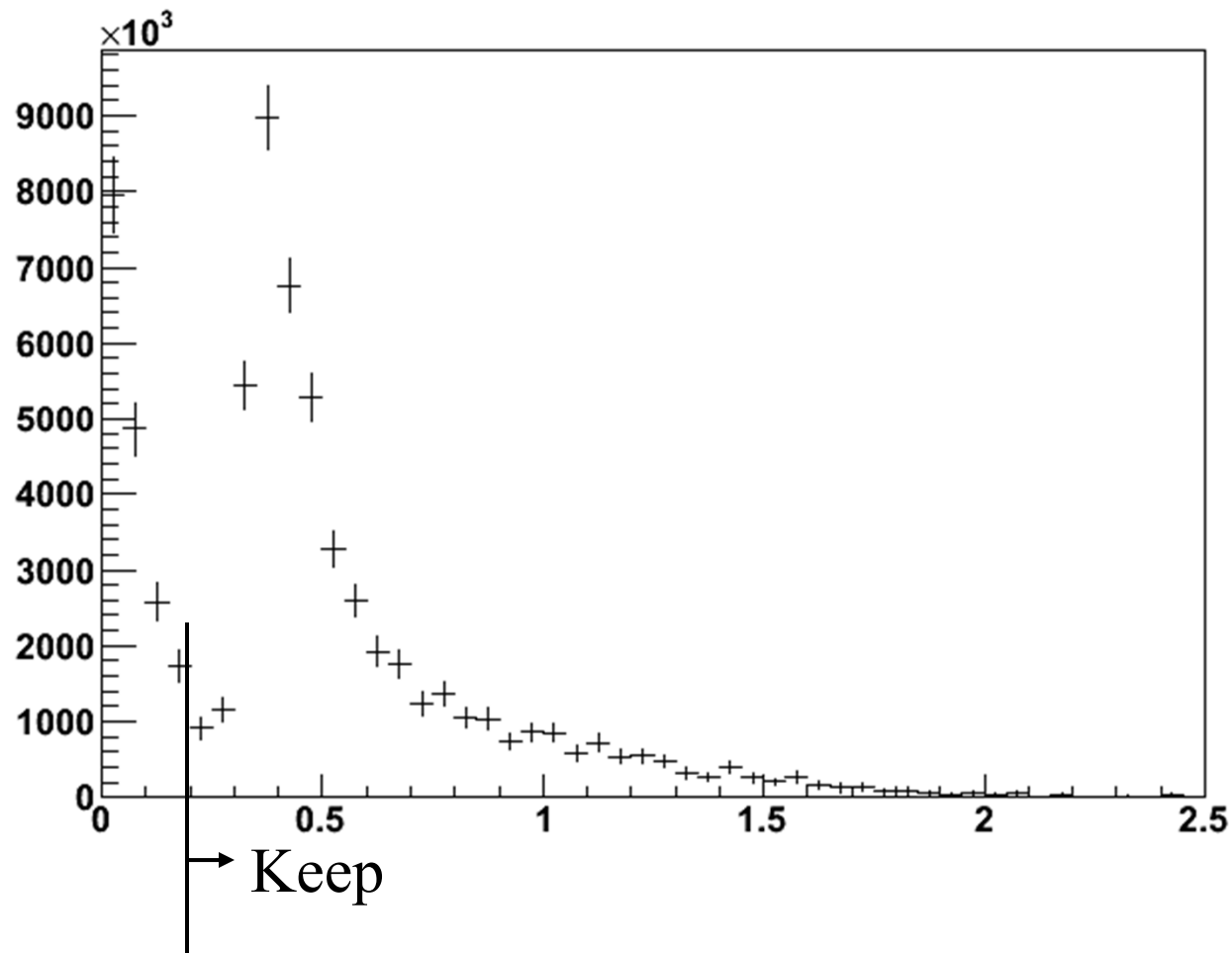

KE > 0.2 MeV θ_R

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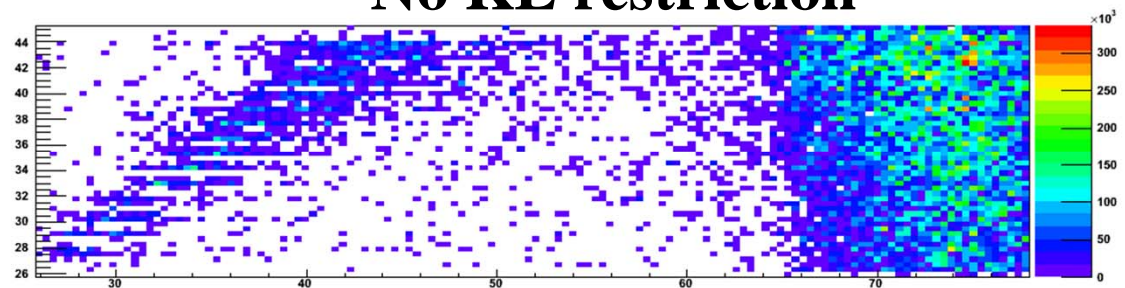
Energy deposited in 1000 micron silicon ring detector versus kinetic energy
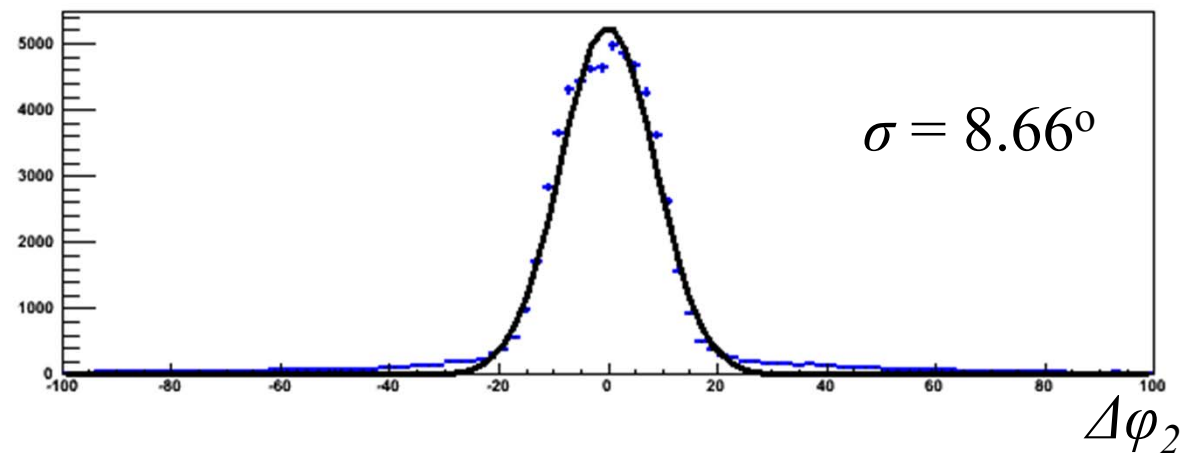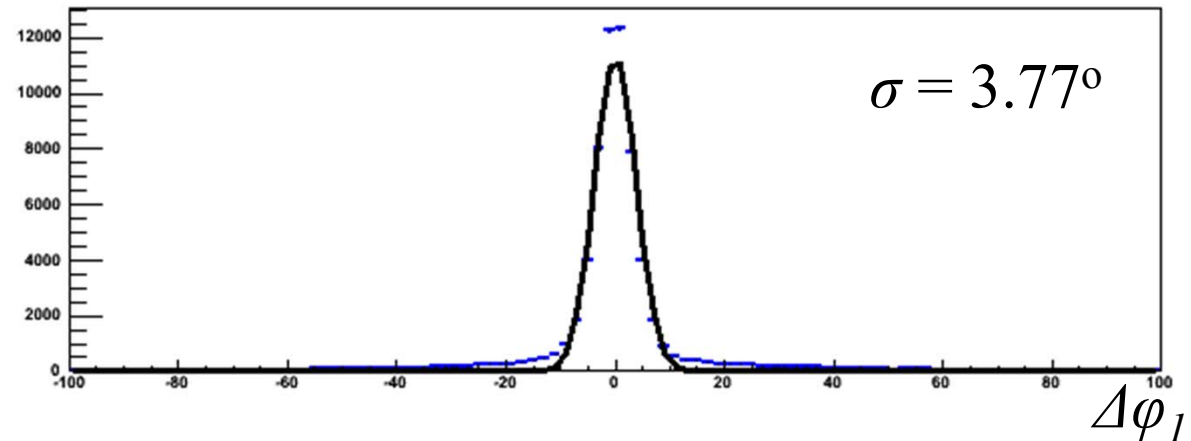
Energy deposited in 1000 micron silicon

Smearing of azimuthal angle

- $\Delta\varphi_1 =$ φ from generator $-\varphi$ at polarimeter

- $\Delta\varphi_2 =$ φ from generator $-\varphi$ digitized from sector hit

$\sigma = 3.77^o$

$\Delta\varphi_1$

$\sigma = 8.66^o$

$\Delta\varphi_2$

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Triplet asymmetry

• Fit function:
$A[1 + B\cos(2\varphi)]$

• Case1: φ from generator and single sector hit, $B = -0.220 \pm 0.008$

• Case2: φ at detector and single sector hit, $B = -0.178 \pm 0.008$ (81% of Case1)

φ

• Case3: φ digitized at detector and single sector hit: $B = -0.168 \pm 0.008$ (76% of Case1)

• Case4: φ digitized at detector, single sector hit, and energy deposited in detector > 0.2 MeV: $B = -0.206 \pm 0.008$ (94% of Case1)

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