

Background Rates in GlueX

March 7, 2007

1 Question

1) What calculation/simulation has been done of the background processes that will dominate the rate in the chambers?

2 Answer

A total of 10^8 9 GeV coherent bremsstrahlung beam photons (see fig. 1) were generated using the geometry and simulation version of January 15. The 10^8 beam photons is approximately 1/110 of second of beam time. The events were processed using the GEANT3 simulation with full geometry and **all processes turned on**, including hadronic interactions.

The dominant process that resulted in rates in the chambers was pair production in the target with some contribution from Compton scattering. Hadronic interactions in the target represent a relatively small contribution to the background rate.

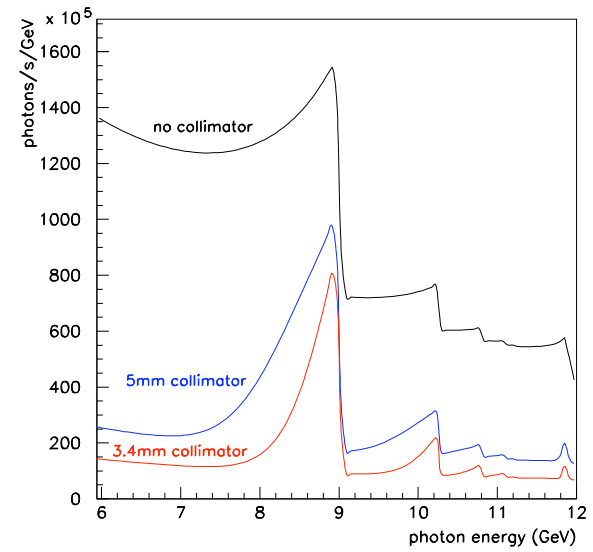


Figure 1: Coherent bremsstrahlung photon energy distribution for GlueX. The red curve labeled “3.4mm collimator” is the distribution used when determining the rates in the GlueX detectors.

CDC

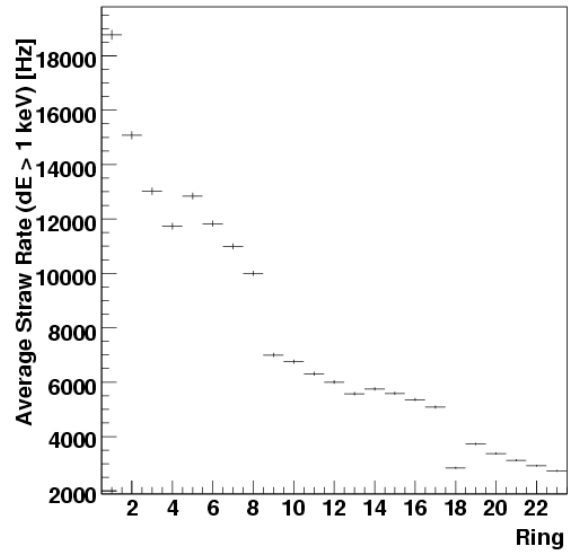


Figure 2: Rates in the CDC by layer for the 23 layer configuration. Layer 1 is closest to the beamline at a distance of about 16 cm for the simulation. Note that the current geometry which was shown in the CDC talk, has 25 layers, but with the closest layer at about 10.5 cm.

FDC

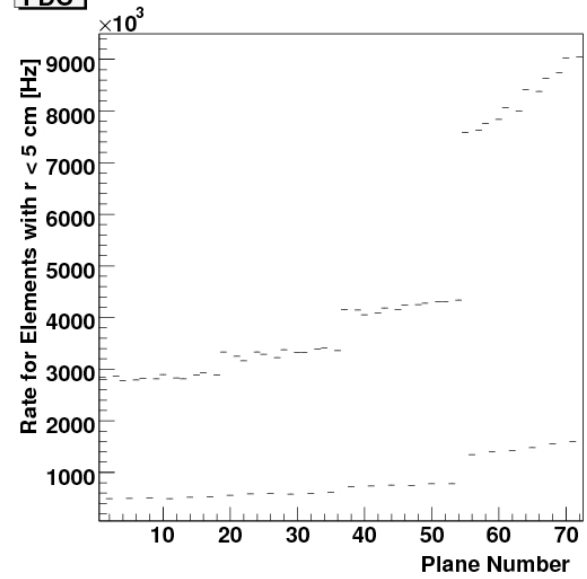


Figure 3: FDC rates as a function of plane. The planes are numbered in the order they are seen by beam particles. Layers alternate as cathode strip, anode wire, cathode strip, cathode strip, anode wire, ...

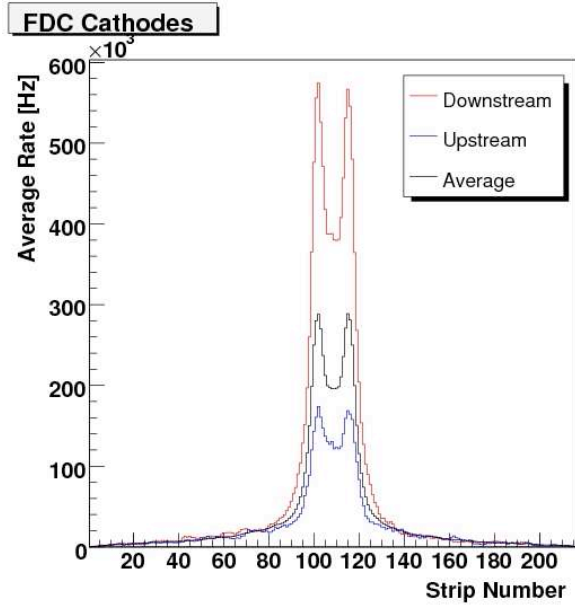


Figure 4: FDC rates for individual strips. The beamline is near strip 108 on this plot. “Upstream” refers to FDC package 1, the furthest upstream package. “Downstream” refers to package 4, the furthest downstream package. Note that the 600kHz rate corresponds to the innermost strips of package 4. Since all packages have wires deadend to the same radius near the beamline, package 4 sees particles down to 0.6° .

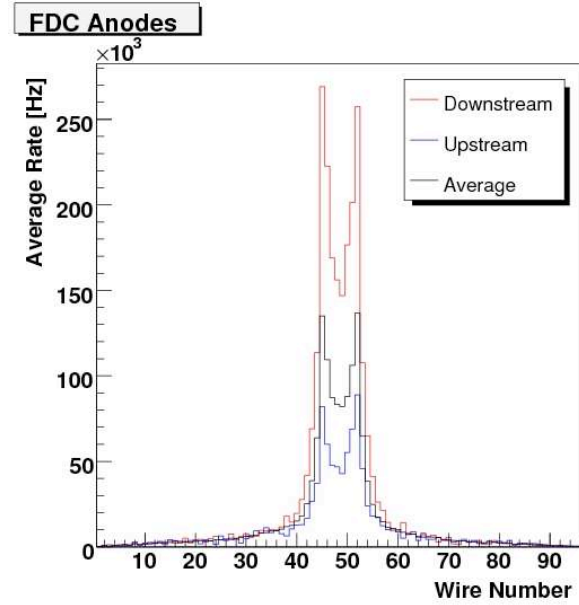


Figure 5: FDC rates for individual anode wires. The beamline is near wire 48. “Upstream” refers to FDC package 1, the furthest upstream package. “Downstream” refers to package 4, the furthest downstream package. Note that the 250kHz rate corresponds to the innermost wires of package 4. Since all packages have wires deadend to the same radius near the beamline, package 4 sees particles down to 0.6° .