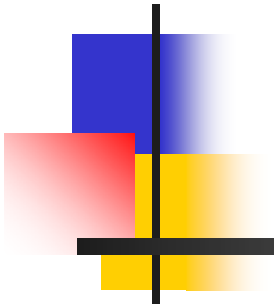

Estimate of Beam Gas Background

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for Uli Kötz
DESY

OLYMPUS Meeting
1.12.2009

Simulation of Beam Gas Background

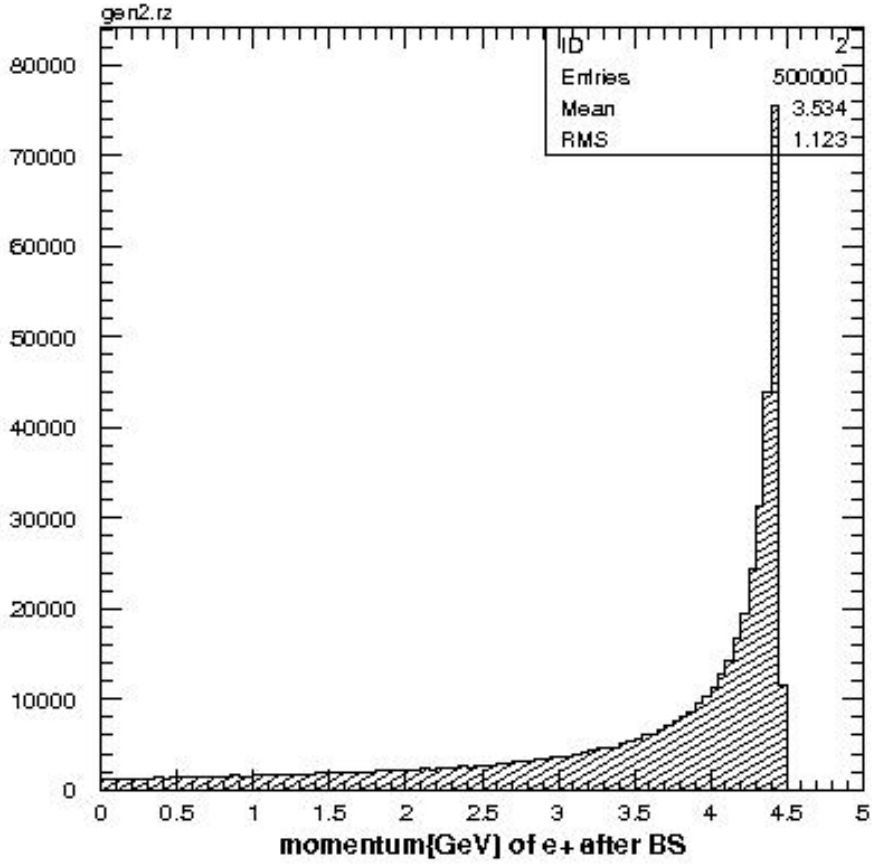
All work done by Uli Kötz, based on HERA background studies in 2002

Method

- Beam tracking using DORIS optics
- Simulate e gas scattering (bremsstrahlung process)
  - Simplified cross section
  - Radiated photon spectrum ~ $1/p_\gamma$
- Track scattered electron using DORIS optics
  - Approximate angular distribution of secondary electrons
  - Consider only particles with energy loss larger 1% of p_b
  - Look at distribution of scattered electrons
  - Get position and energy distribution of scattered electrons hitting fixed collimator in from of target cell
  - Interaction or showering of electrons not simulated
  - Can use distribution as input for OLYMPUS GEANT simulation
- Assumptions
  - Beam energy 4.5 GeV, current 140mA
  - Gas pressure 5 10^{-9} mbar, composition 100% CO

Simulation of Beam Gas Background

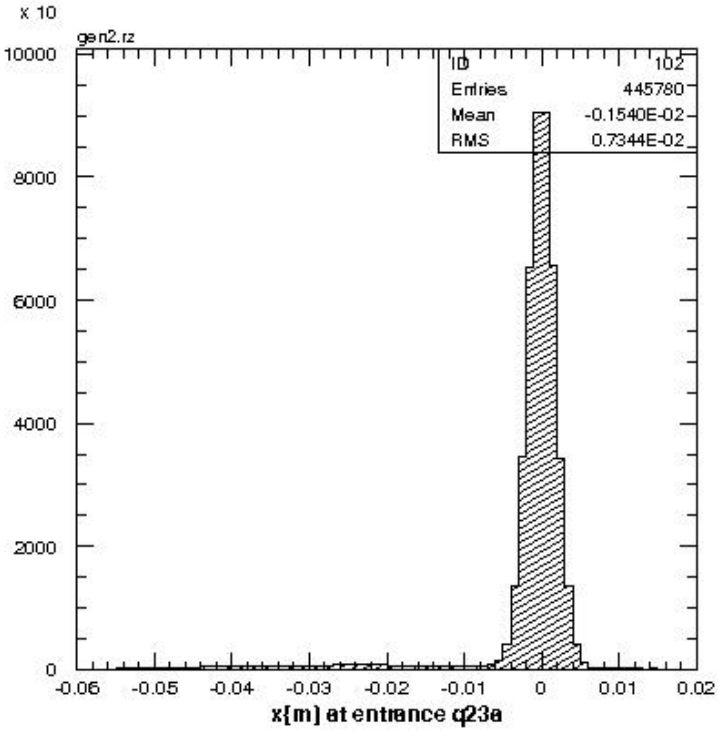
Electron momentum after bremsstrahlung

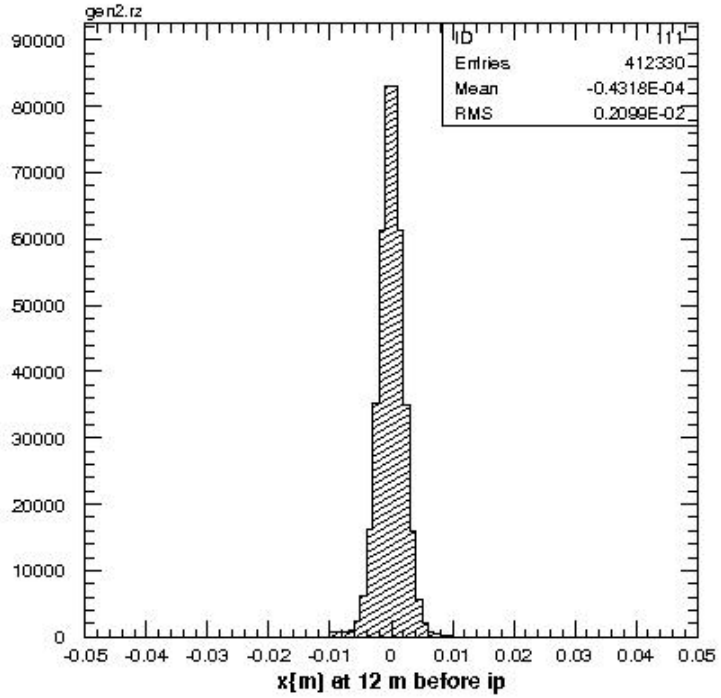


Simulation of Beam Gas Background

Horizontal distribution of electrons
23 and 12m in front of IP

Assumed collimator at 12 from IP
After collimator at 12m from IP
Opening ±10mm

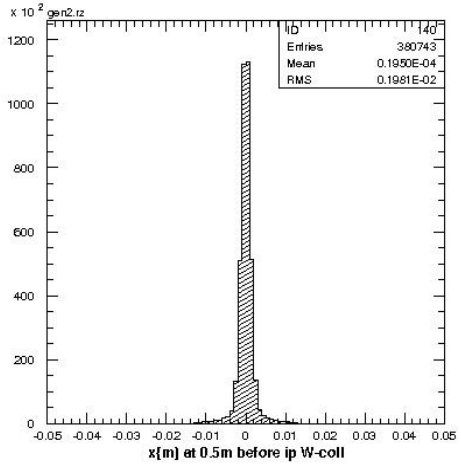


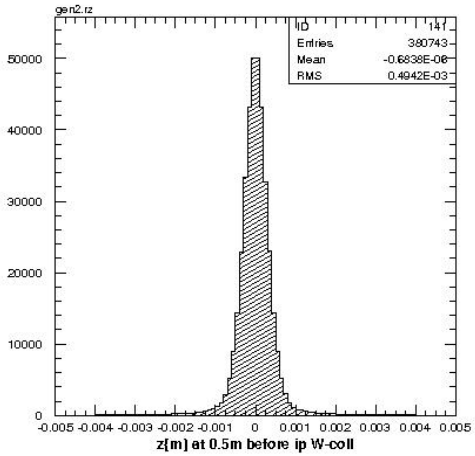


Simulation of Beam Gas Background

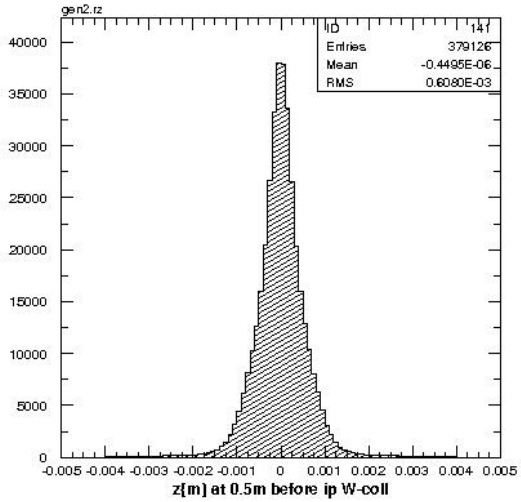
Horizontal and vertical distribution of electrons after fixed collimator 0.5m in front of IP

Opening ±13mm horizontal, ±4mm vertical



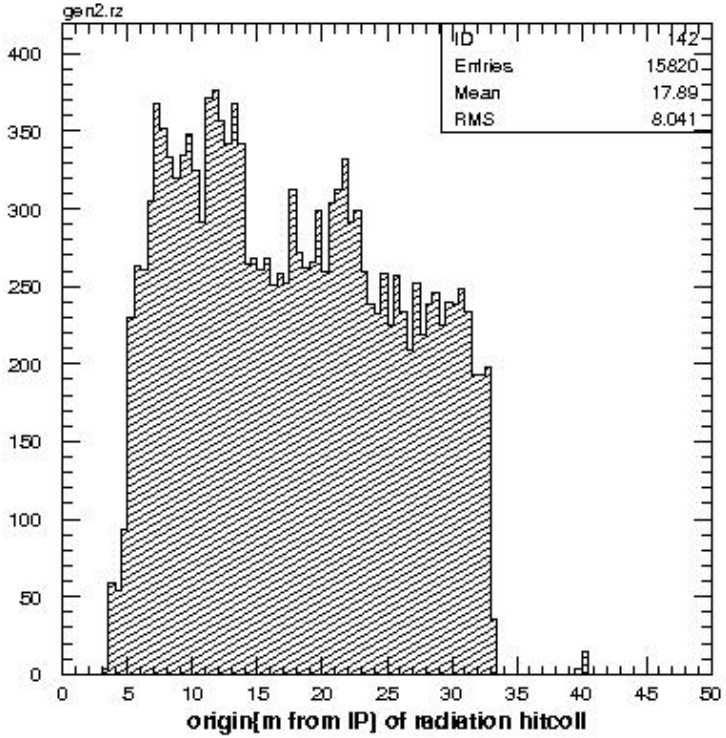


2.3 GeV

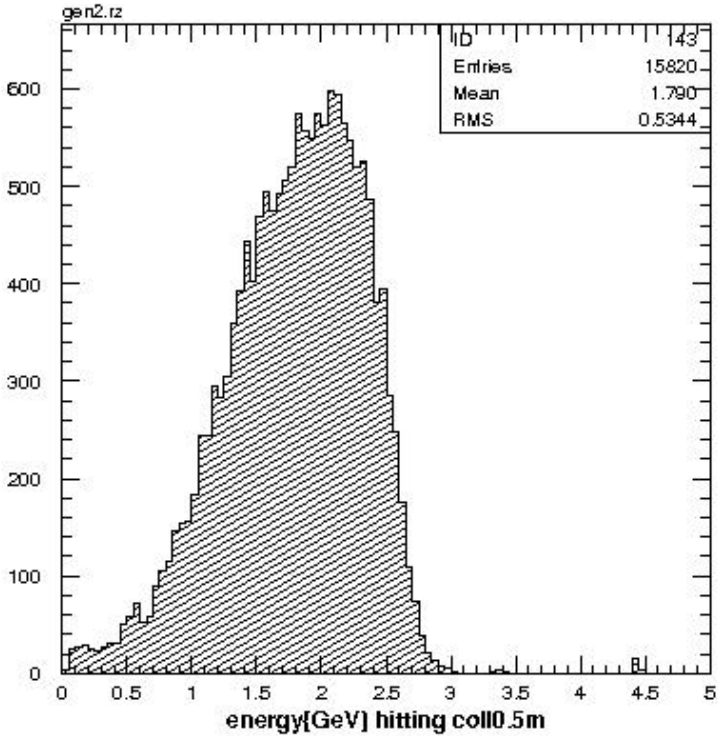


Simulation of Beam Gas Background

Origin of electrons
hitting fixed collimator



Energy of electrons
hitting fixed collimator
rate 110kHz

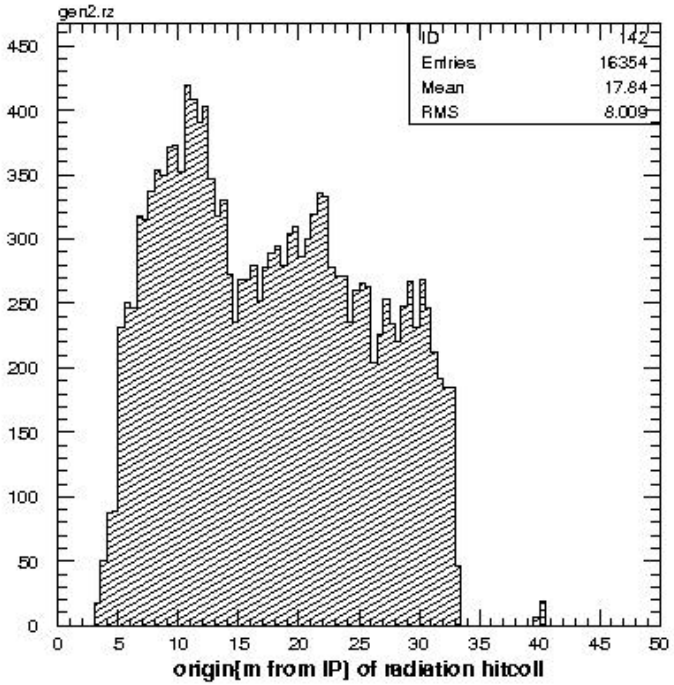


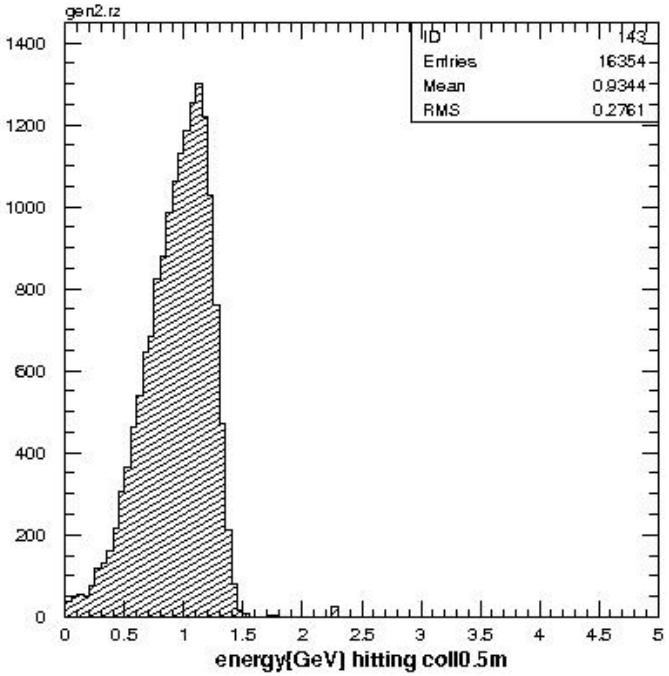
Simulation of Beam Gas Background

Origin of electrons
hitting fixed collimator

Energy of electrons
hitting fixed collimator
rate ~110kHz

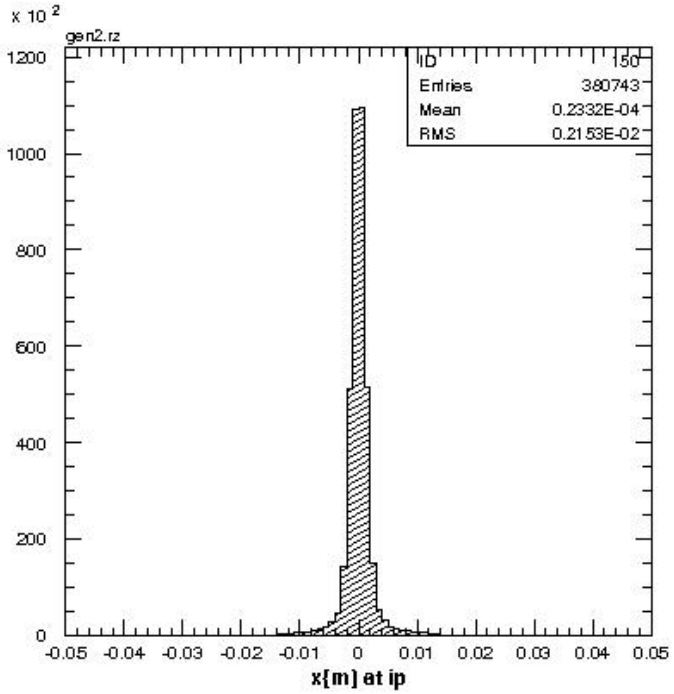
2.3 GeV

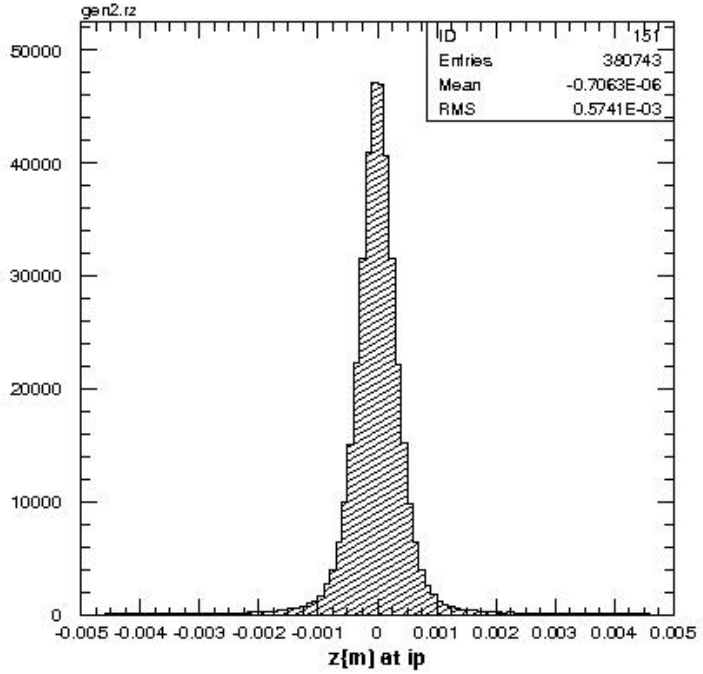




Simulation of Beam Gas Background

Horizontal and vertical distribution of electrons at IP





Conclusions

First estimate of beam gas background hitting fixed collimator
Rate 110 kHz

Results/output file can be used as input for OLYMPUS GEANT simulation