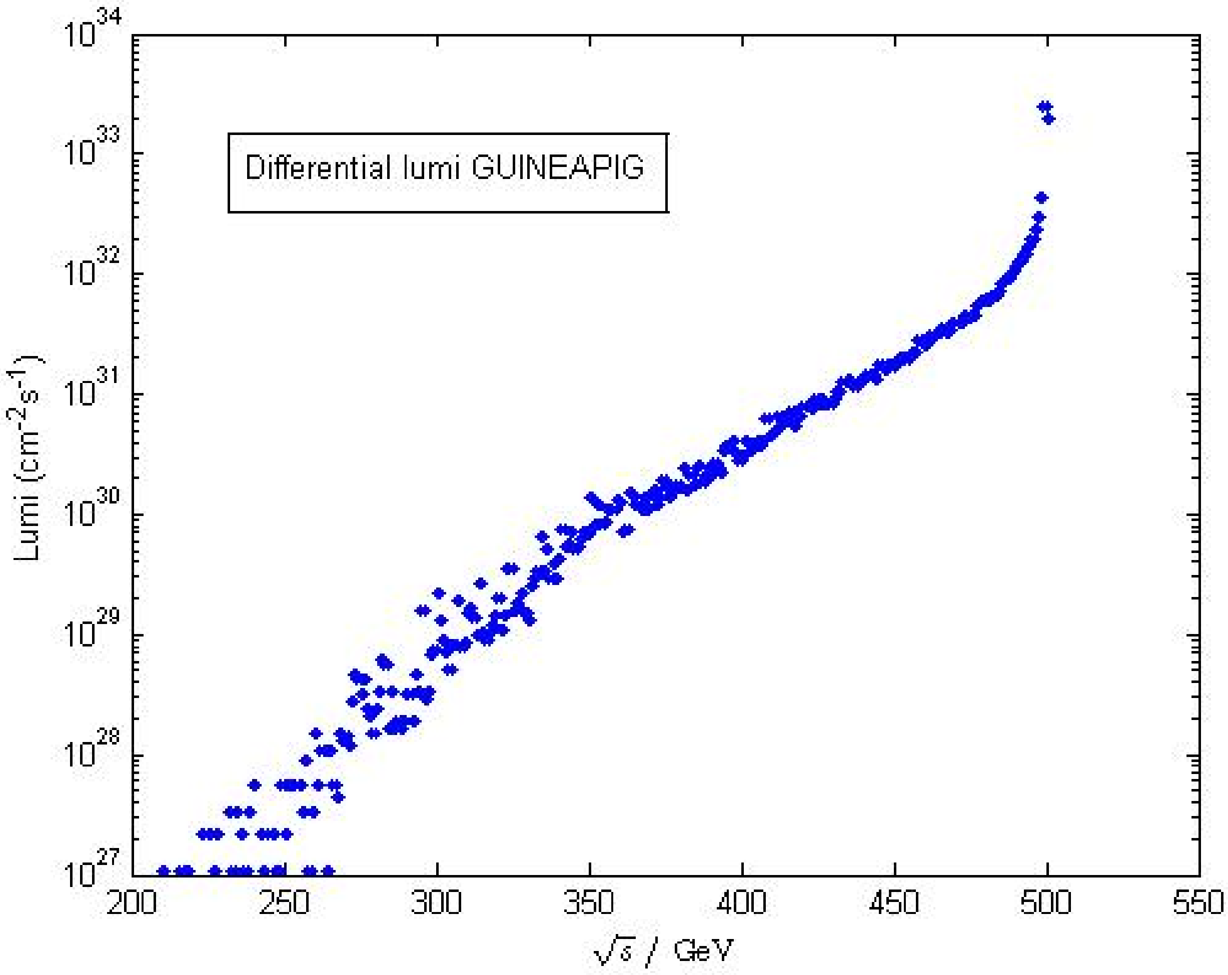
Accelerator backgrounds for MAPS

- Use GUINEAPIG generator (Daniel Schulte/CERN)
  - The de facto standard accel. phys. code for beam-beam interactions
- Large number of high-energy photons interact with electron (positron) beam and generate *e^+e^- pairs*
  - Low energies (beamstrahlung param., $\Upsilon<0.6$), pairs made by *incoherent* process photons interact directly with individual beam particles
- Incoherent *e^+e^-* pairs $\Upsilon<0.6$
  - Breit-Wheeler: $\gamma\gamma \rightarrow e^+e^-$
  - Bethe-Heitler: $e^\pm \rightarrow e^\pm e^+ e^-$
  - Landau-Lifshitz: $e^+e^- \rightarrow e^+e^- e^+e^-$
- Coherent pairs High energies ($0.6<\Upsilon<100$), *coherent* pairs are generated by interaction of photons with field of opposing beam

Luminosity



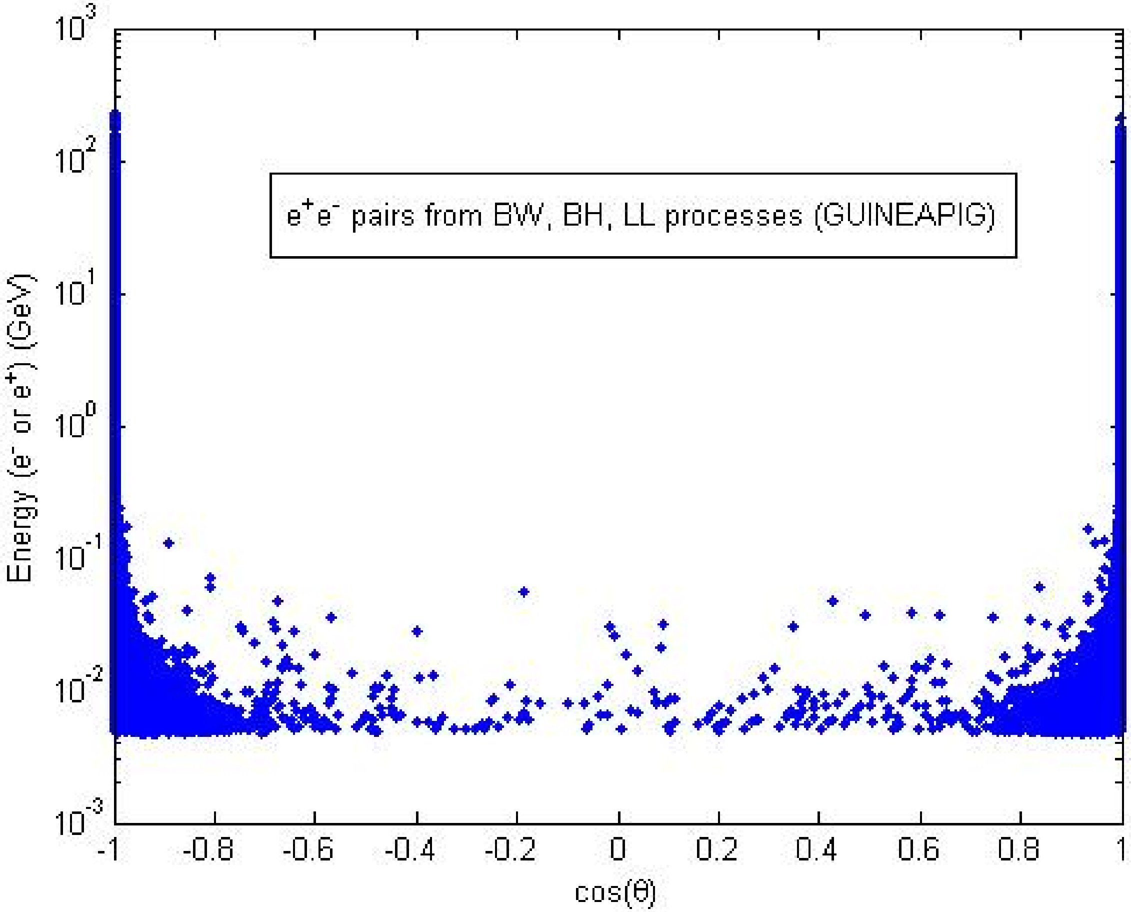
Fraction of lumi delivered at actual centre-of-mass energy

Initial background rates…

Per bunch crossing (x2800, or x 5600, per 0.5-1.0ms train)

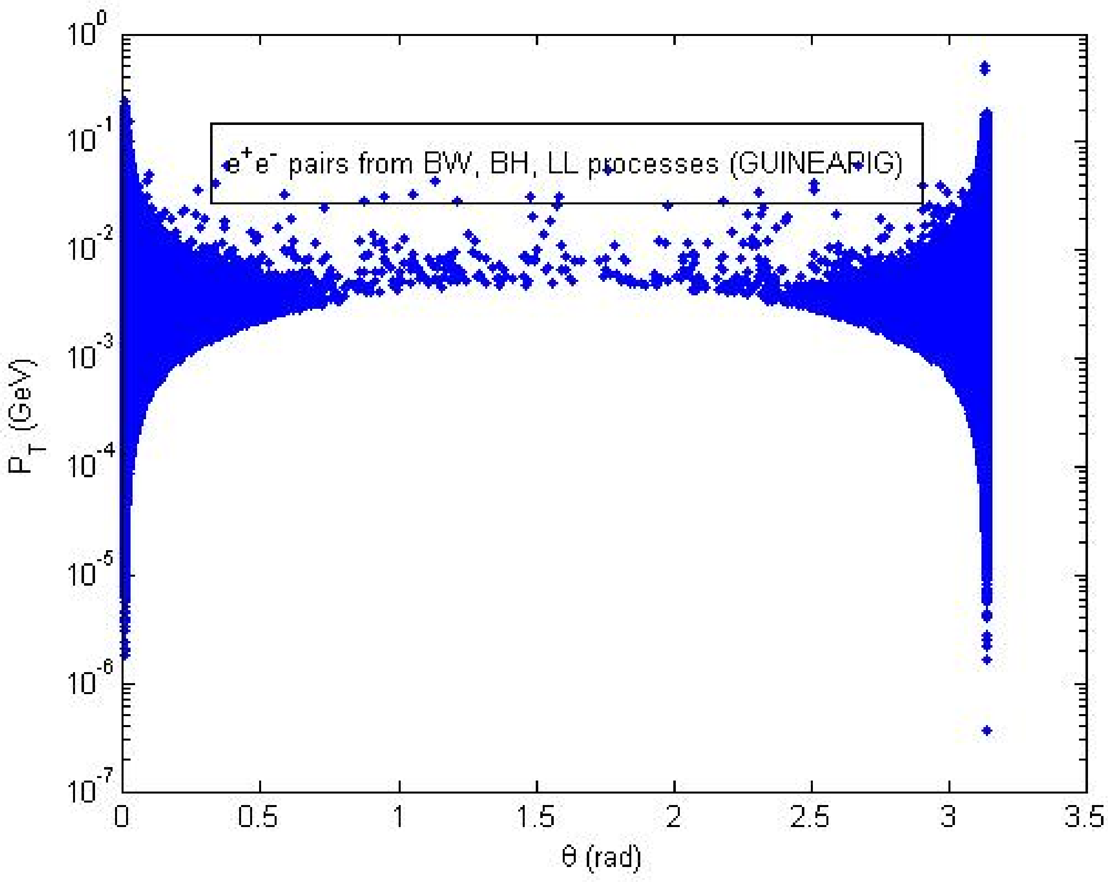
- e^+e^- pairs: Total no.=141k
  - 3k - Breit-Wheeler: $\gamma\gamma \rightarrow e^+e^-$
  - 80k - Bethe-Heitler: $e^\pm \rightarrow e^\pm e^+ e^-$
  - 58k - Landau-Lifshitz: $e^+e^- \rightarrow e^+e^- e^+e^-$
- Hadronic events: ~0.7
  - $e\gamma$, $\gamma\gamma$ processes

e^+e^- pairs



- Nominal ILC parameter set

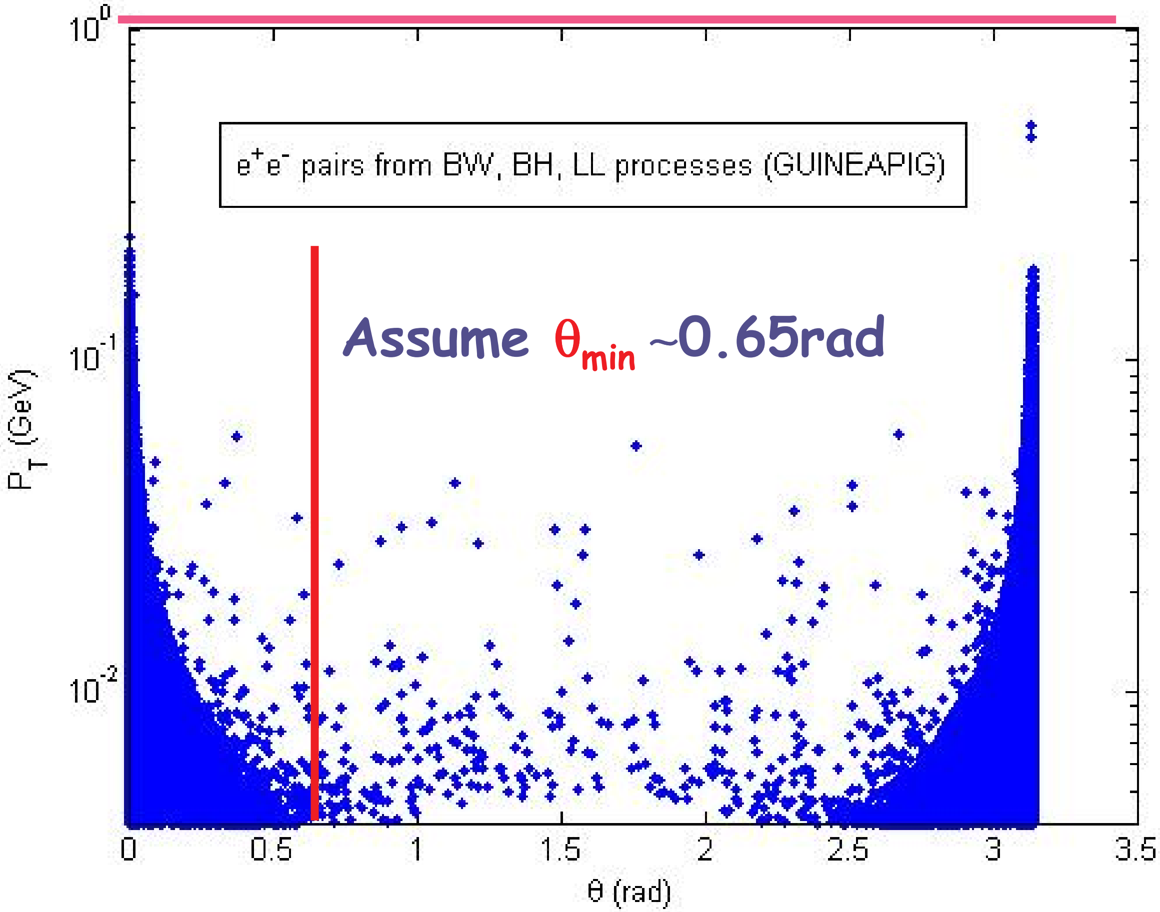
e^+e^- pairs



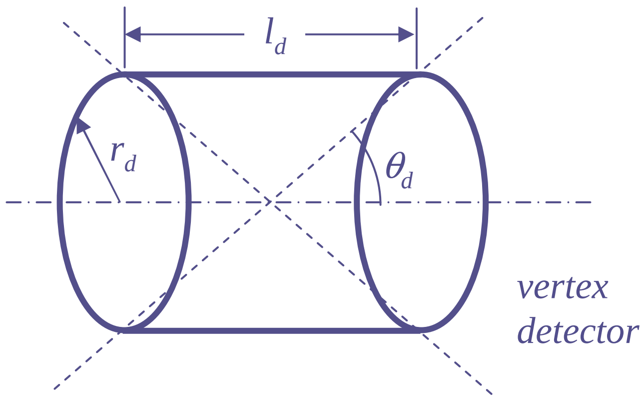
$$r = \frac{P_T}{cB_z} < r_d$$

- Nominal ILC parameter set

e^+e^- pairs: ECAL barrel



[Sketch c/o N Walker]



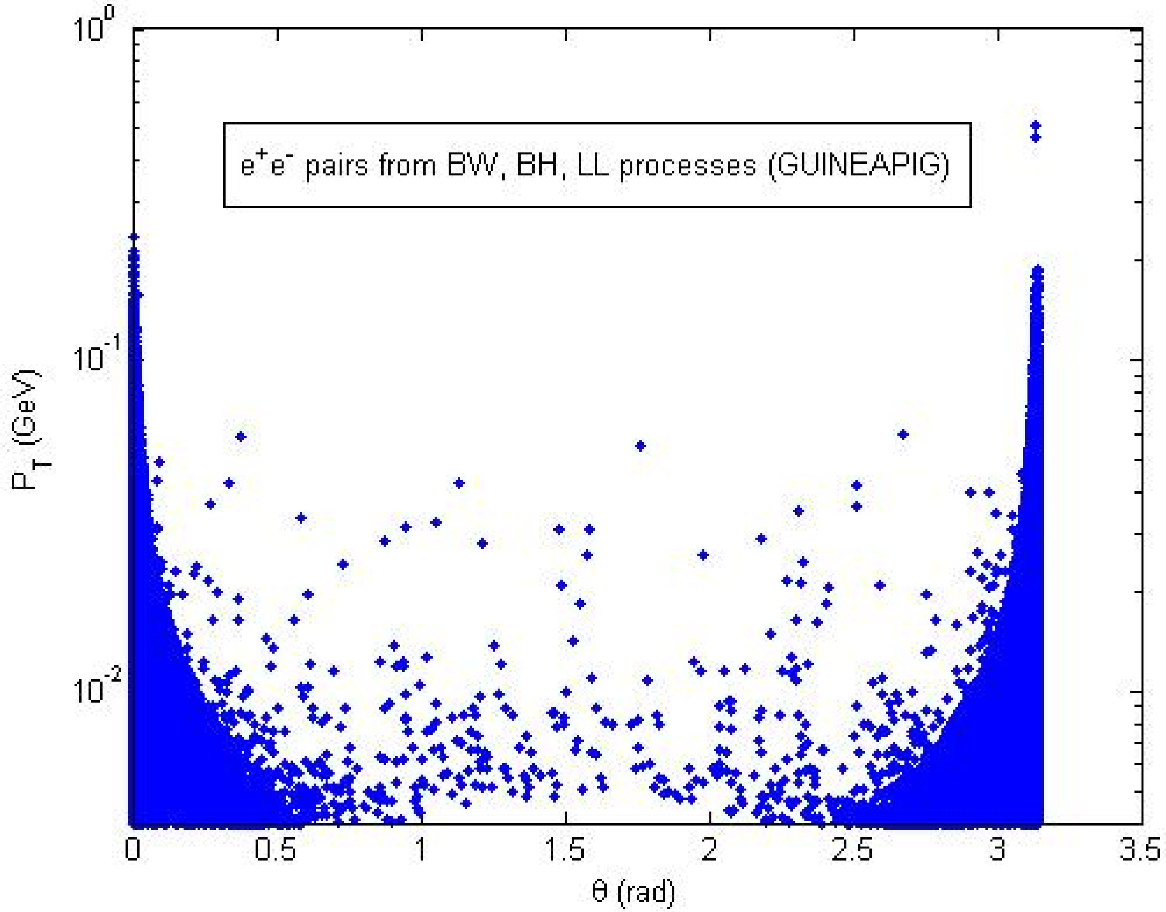
$$r = \frac{P_T}{cB_z} < r_d$$

To **not hit** barrel (r~1.6m in LDC)

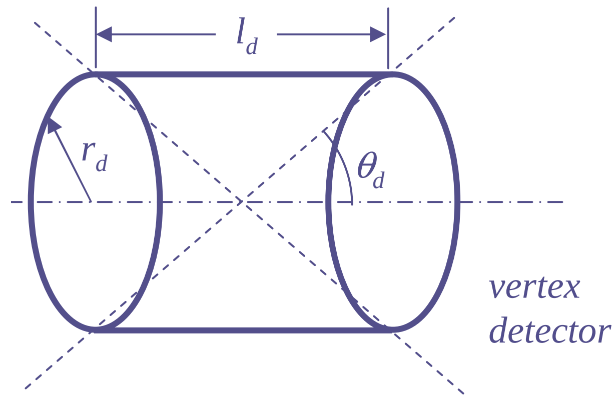
r of helix must be must be less than half of r_d

i.e. need P_T>0.5x(0.3x4Tx1.6) ~ 1 GeV

e^+e^- pairs: Endcap



[Sketch c/o N Walker]



$$r = \frac{P_T}{cB_z} < r_d$$

To **not hit** ECAL endcap (min. r ~? in LDC)

r of helix must be must be less than half of r_d

i.e. need P_T>0.5x(0.3x4Tx?) ~ ? GeV

Next Steps

- Extend trivial P_T vs. θ study so far to include photons, hadrons, minijets – technically the same treatment in GUINEAPIG framework

Fast ~ 1 week

- Check with machine optics team we have most up-to-date machine parameters
  - Note: Likely there will be just one IR at ILC (+"push-pull" operation if two detectors)… GDE CCB request post-Valencia…

~days

- Compare 5 current ILC parameter sets (high Q, high lumi, …), to make sure we are looking for worst case scenario for detector occupancy, repeat all of above

Fast ~ 1 week

- Process 4-vectors for worst case with Mokka, with "safe" P_T cuts to avoid detector sim. for events which will never cause problem for detector

Slower – but speed up by careful choice of min. P_T of pairs to simulate inside detector. Develop Marlin code for study while LCIO files being generated.