Update on $\gamma\gamma \rightarrow hadrons$ Calculation

Tim Barklow
SLAC
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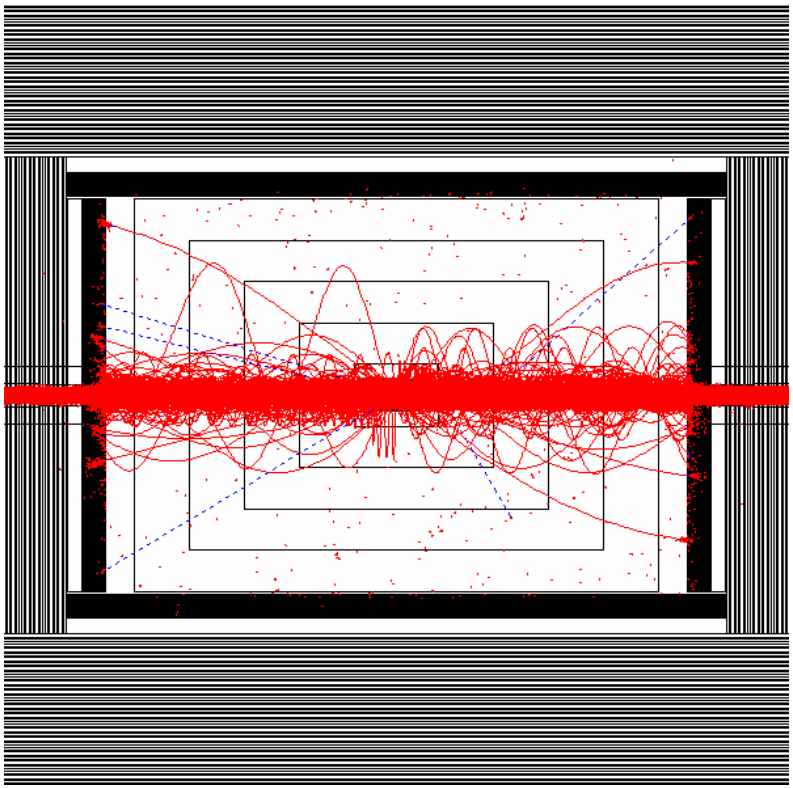
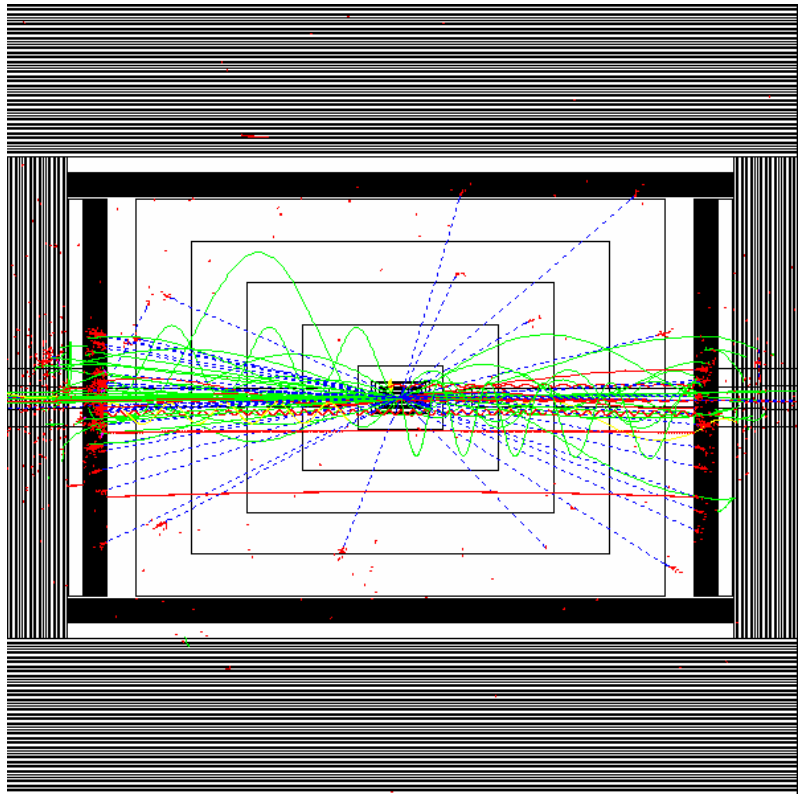
Beam-Beam Background

- Most beam-beam background work has focused on e^+e^- pairs and high-pt hadrons.
- Muon pairs and low-pt hadrons are also produced and perhaps these events are important for forward tracking & calorimetry.



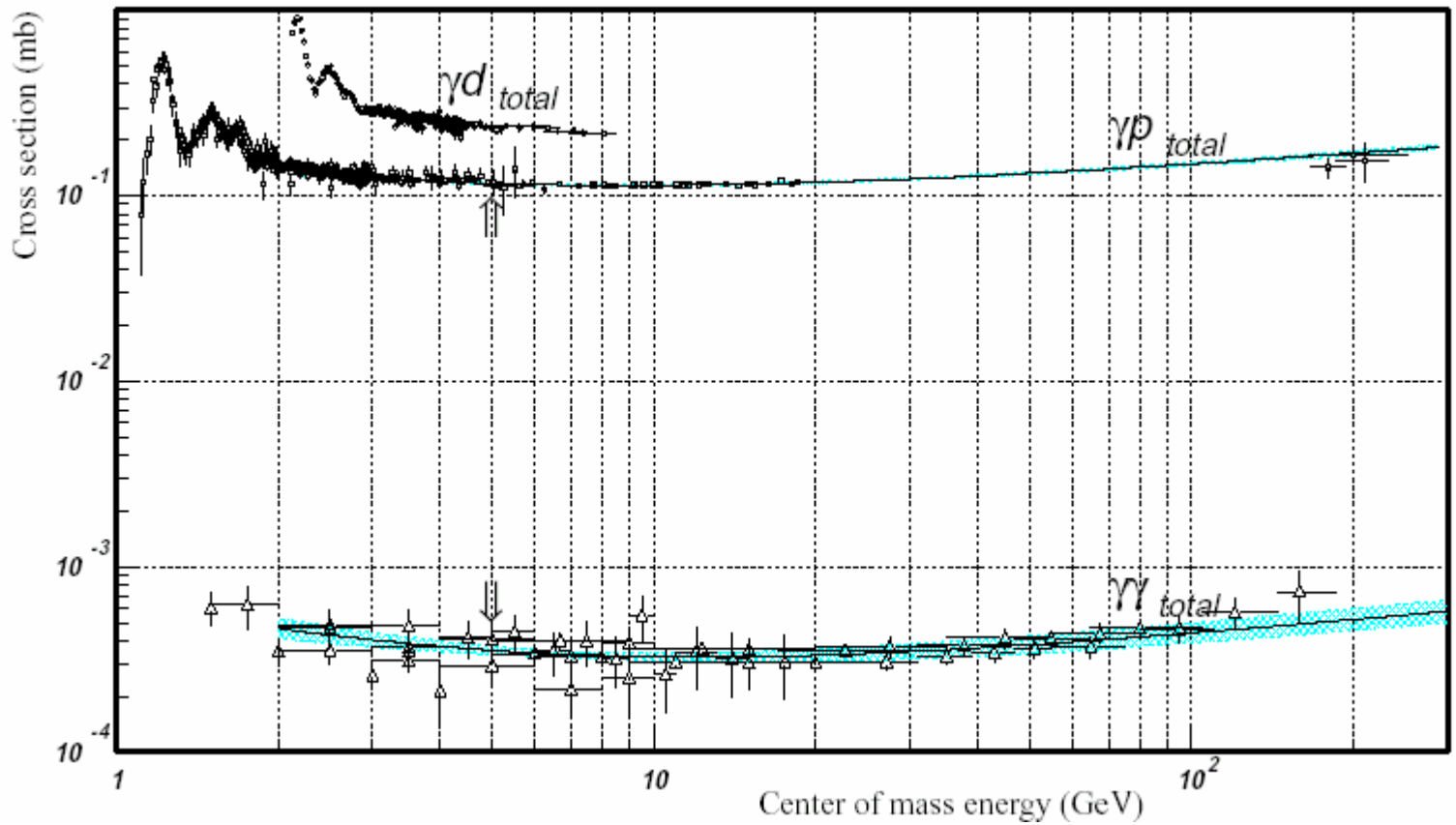
$8600\ e^+e^-$ pairs / train strike detector

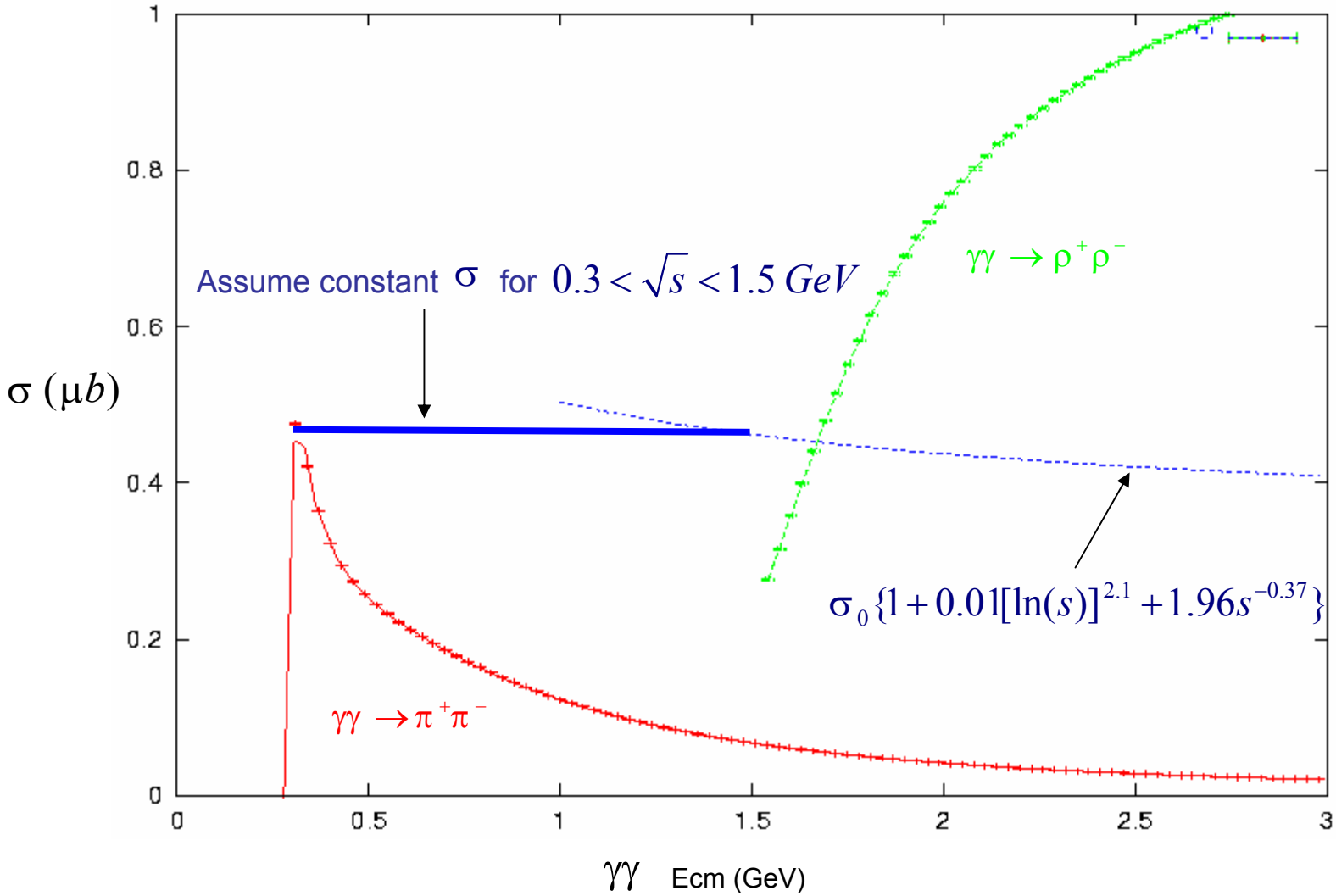


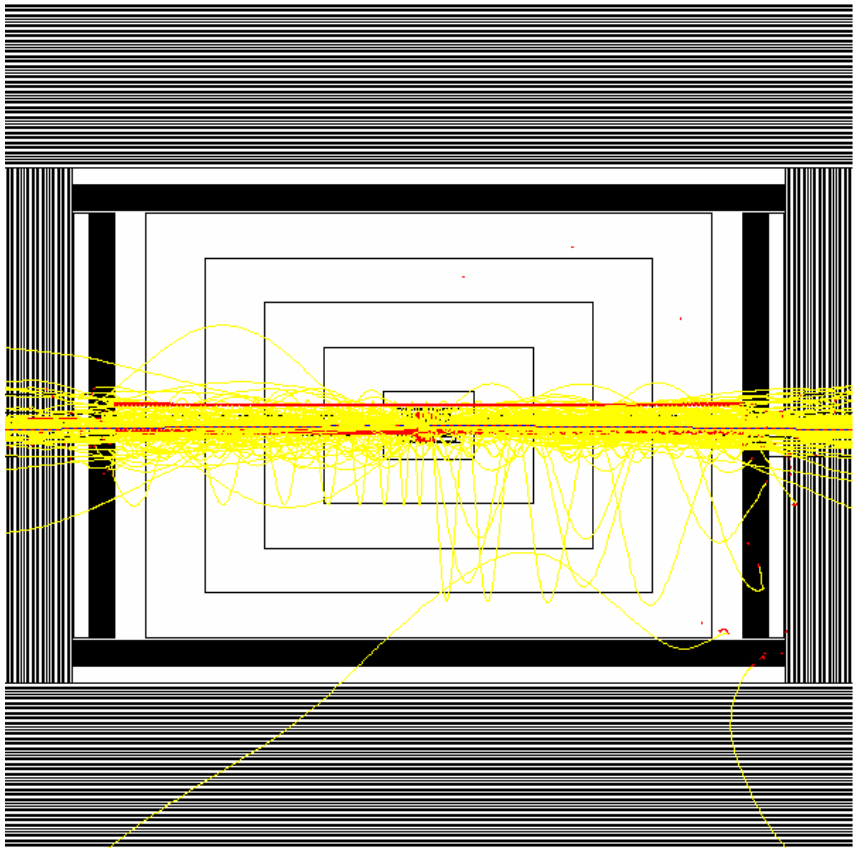
1.8 hadronic events / train with pt>2.2GeV
(TESLA TDR definition of hadronic bkgnd)
79 GeV / train detected energy
14.6 detected charged tracks / train

Simulating Hadronic Events

- WHIZARD is used to simulate virtual photon flux & beamstrahlung flux (CIRCE).
- Total hadronic cross section given by a canonical formula for Ecm > 1.5 GeV and by a constant 490 nb for 0.3 < Ecm < 1.5 GeV
- PYTHIA is used to model low and high-pt hadronic events for Ecm > 2 GeV
- Isotropic production of 2, 3, or 4 pions for 0.3<Ecm < 2 GeV.


Cross section (mb)
γd_{total}
γp_{total}
$\gamma\gamma_{total}$
10^{-1}
10^{-2}
10^{-3}
10^{-4}
1
10
10^2
Center of mass energy (GeV)

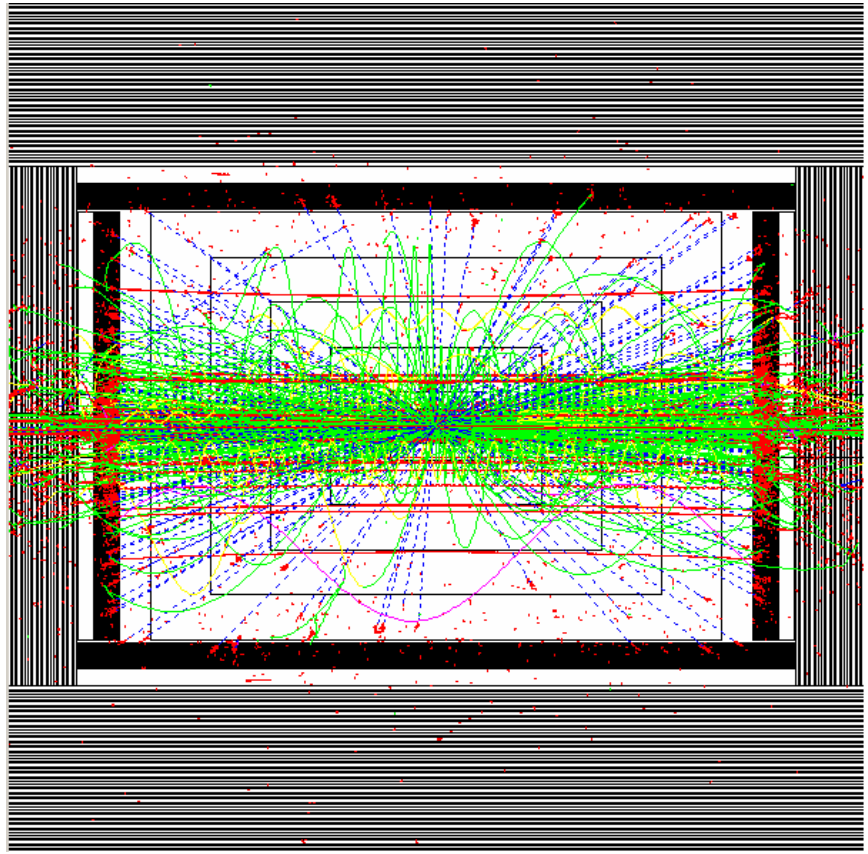

Assume constant σ for $0.3 < \sqrt{s} < 1.5\ GeV$
$\gamma\gamma \to \rho^+\rho^-$
$\sigma_0\{1 + 0.01[\ln(s)]^{2.1} + 1.96s^{-0.37}\}$
$\gamma\gamma \to \pi^+\pi^-$
σ (μb)
γγ Ecm (GeV)
0
0.2
0.4
0.6
0.8
1
0
0.5
1
1.5
2
2.5
3



154 $\mu^+\mu^-$ pairs / train

56 GeV / train detected energy

24 detected charged tracks / train

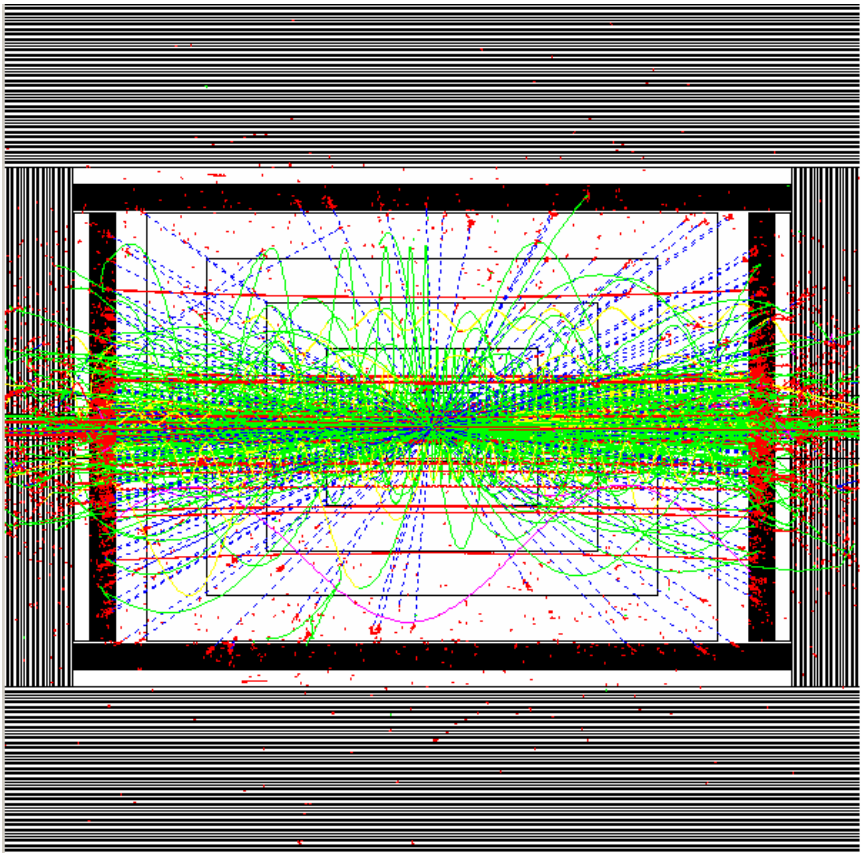


56 hadronic events / train

no pt cut; Ecm down to $\pi^+\pi^-$ threshold

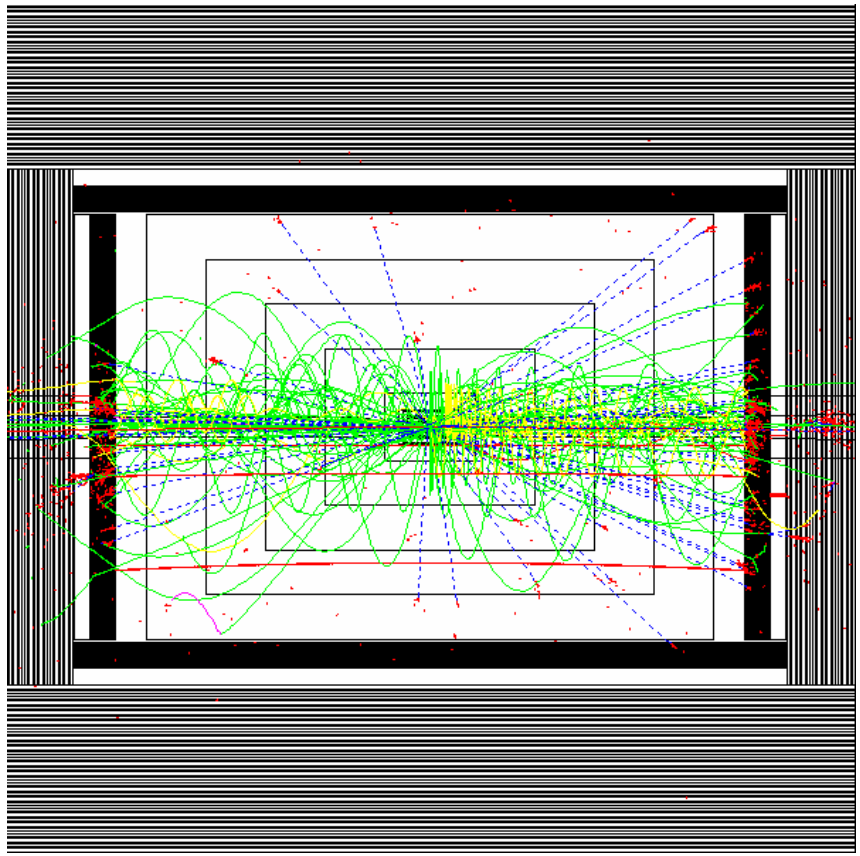
454 GeV / train detected energy

100 detected charged tracks / train



full train (56 events)
454 GeV detected energy
100 detected charged tracks

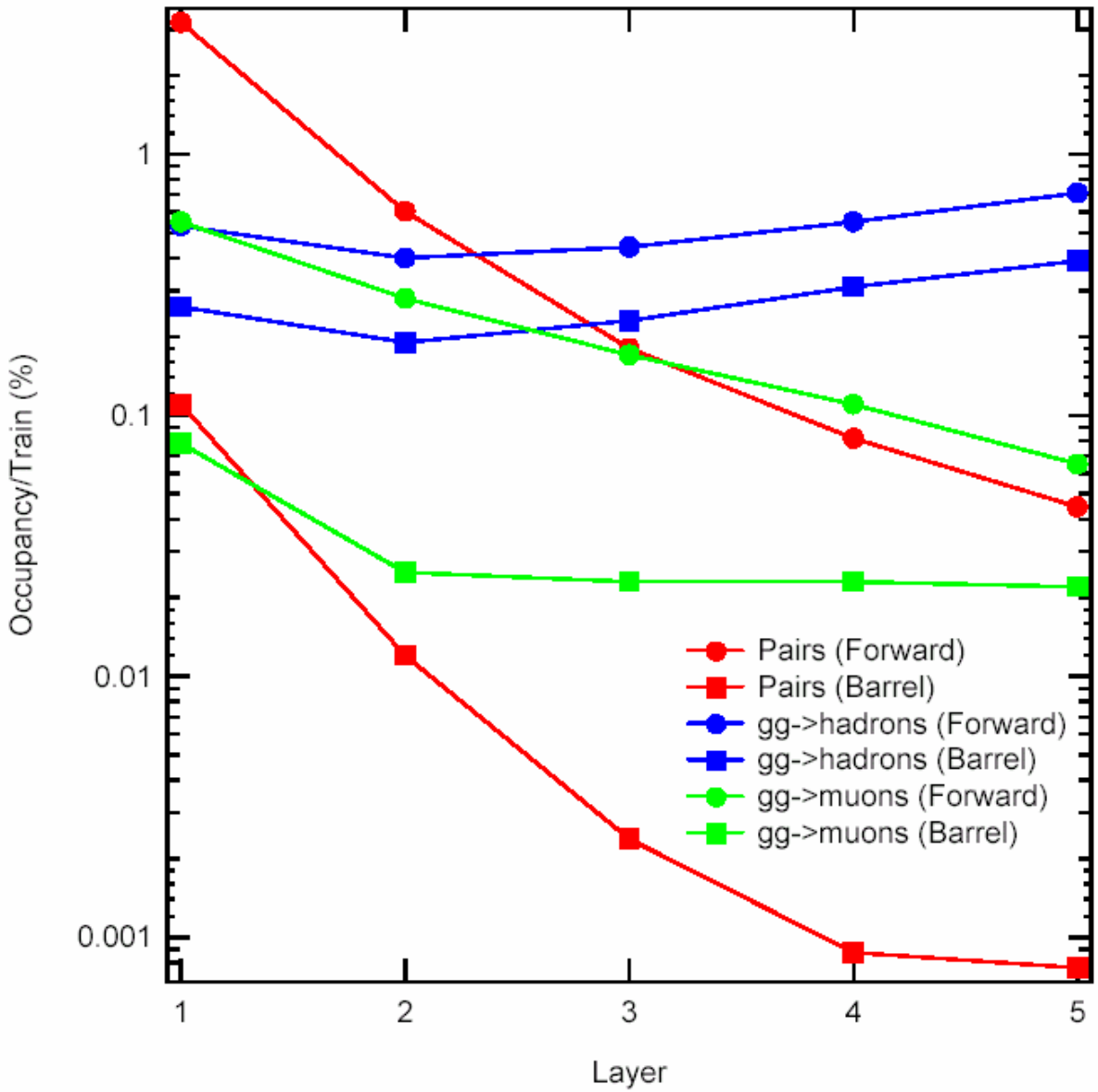
no timing



1/3 train (19 events)
151 GeV detected energy
33 detected charged tracks

21 nsec timing resolution
(require 3σ separation)

Tracker Occupancies



Summary

- Muon pairs and low-pt hadrons produced in the beam-beam interaction need to be considered along with e^+e^- pairs and high-pt hadrons.
- Muon pairs and hadrons create 124 detected charged tracks and 510 GeV detected energy per train. Tracker occupancies comparable to or greater than the occupancies from e^+e^- pairs.
- Further studies required to determine how well this background can be tagged and how much it will interfere with signal track finding/fitting and physics analyses.