# Update on ILC Simulation Studies at SCIPP

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# Overview

- Recent Work -
- Beam Calorimeter Studies for the default SID02 design.
- “Seed Extend” - A reconstruction algorithm for tracks having only 3 hits in the outer layers of the Tracker Barrel.
- Interest in further contributions to the DBD studies, including the development of coding infrastructure.

# Beam Calorimeter Studies

Determine an Electron Identification Efficiency for the Beam Calorimeter in the most recent default SID02 design. We are motivated to reexamine the Electron selection performance with recent alternative beam collision parameters.

- Work has begun following the guidelines defined in the 2010 study at Colorado University, which can be found at : http://hep-www.colorado.edu/~uriel/Beamstrahl_TwoPhoton-Process/effic3.pdf

- As noted in the paper, “The primary challenge to seeing these high energy particles is the immensely energetic beamstrahlung deposition on the BeamCal, which dwarfs high energy electron showers by orders of magnitude.”

- To accomplish identification of high energy electron showers a clustering algorithm is needed, such an algorithm is described in the Colorado Study.

# Beam Calorimeter Studies

Clustering Algorithm (as described in Colorado paper):

1. Try to determine the axis of the electron shower. We first find the expected beamstrahlung deposition on each tile, and subtract this average from each tile in the overlaid shower. We then use this subtracted shower to find candidate shower axes, and apply the steps below to each candidate to find the most favorable candidate.

2. Going back to the full (unsubtracted) shower, draw a small cylinder around the shower axis found in the previous step, and discard tiles outside of the cylinder.

3. Apply a depth cut, where any tiles shallower than a set depth are discarded.

4. Finally, calculate the total expected beamstrahlung deposition on the remaining tiles, and subtract this number from the total energy on the remaining tiles. Thus we're left with a subtracted cluster energy.

The subtracted cluster energy can then be used in tagging electrons, by comparing to the expected average beamstrahlung energy deposition.

# Beam Calorimeter Studies

Current Progress -

Work has begun to build the clustering algorithm defined in the Colorado paper. A tiling scheme has been defined on the calorimeter using 5x5 [mm] tiles in (x,y), and an algorithm was developed to calculate and then access the average Beamstrahlung energy on a per tile basis in overlaid events, as required by the clustering algorithm.

We have obtained samples for study -

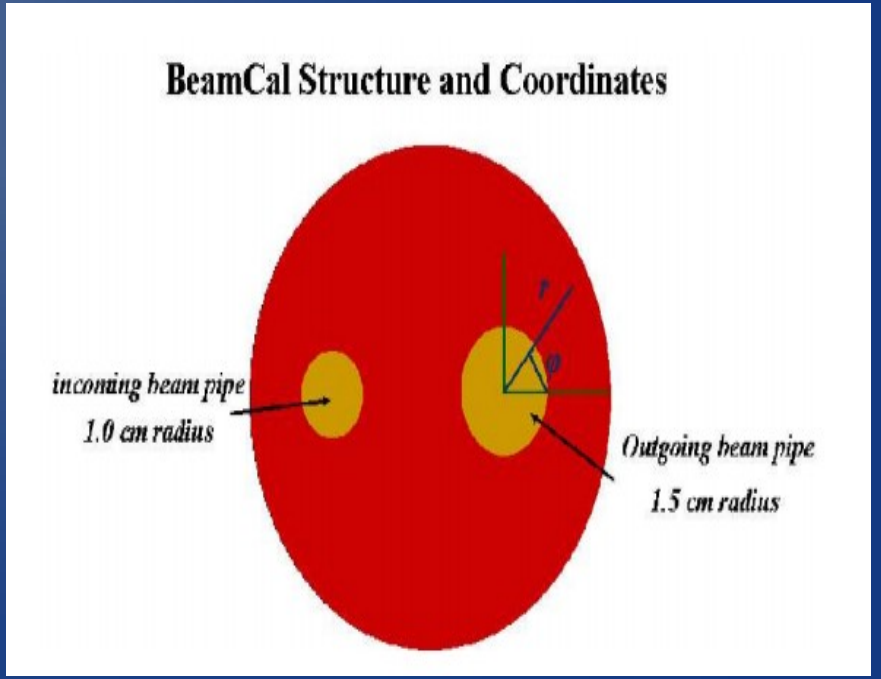
Signal :

Electrons at 250GeV between theta of 0 and 2.5 degrees, flat over phi between 0 and 2pi.

Background:

Guineapig generated events corresponding to the ILC500 nominal machine configuration which have been passed through the sid02 detector model.

These are equivalent to the data used in the Colorado Study.



# Seed Extend

- Reconstruction of tracks with only three outer hits in the Tracker Barrel.
- Algorithm attempts to recreate a track by matching a “stub” found in the Calorimeter with a group of three hits from the outer Tracker Barrel.
- At the moment, Seed Extend has a poor efficiency of finding tracks.
- Current work by, Benjamin Michlin to increase Seed Extends ability to reconstruct tracks efficiently.
- We would like to use Seed Extend in the future to study the Stau → Tau decay reconstruction efficiency in the outer region of the barrel.

# Future Work

- We are interested in contributing code to the lcsim package. Our first interest was maintaining or upgrading the deprecated “Garfield” reconstruction package, but we have heard that someone else was taking on Garfield.
- We are interested in making an contribution that would be helpful to the DBD studies, including collaborating with Garfield development, or any development of the coding infrastructure.
- We are ready for technical work involving heavier coding. I spent time writing a “Fast Track Simulation” for CLIC this past fall, this involved heavy use of the LCIO libraries as well as using Monte Carlo techniques such as Gaussian smearing. I have done a considerable amount of technical work in the past two years including ATLAS simulation studies in Athena, setting up an ATLAS Tier3 cluster of 9 computers at UCSC, and on going ILC studies using the lcsim framework.