

LCD Simulations  
with  
Beamstrahlung Backgrounds

Gary R. Bower

SLAC LCD Meeting

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# Bunches and trains

- NLC bunch trains contain 95 bunches with  $\sim 3$  nsec separation.
- Crossing angle  $\rightarrow e^+$  bunch#1 X  $e^-$  bunch#1,  $e^+$  bunch#2 X  $e^-$  bunch#2, ..., ie only 95 Xings.
- Detector triggers and reads out and accelerator dumps beam at train level, not at bunch level.
- Bunch Xing #57 may have a physics event, but all 95 bunch Xings will have beamstrahlung.
- Bunch Xing #89 may have a beam gas or a two photon interaction as well.

# Background overlay issues

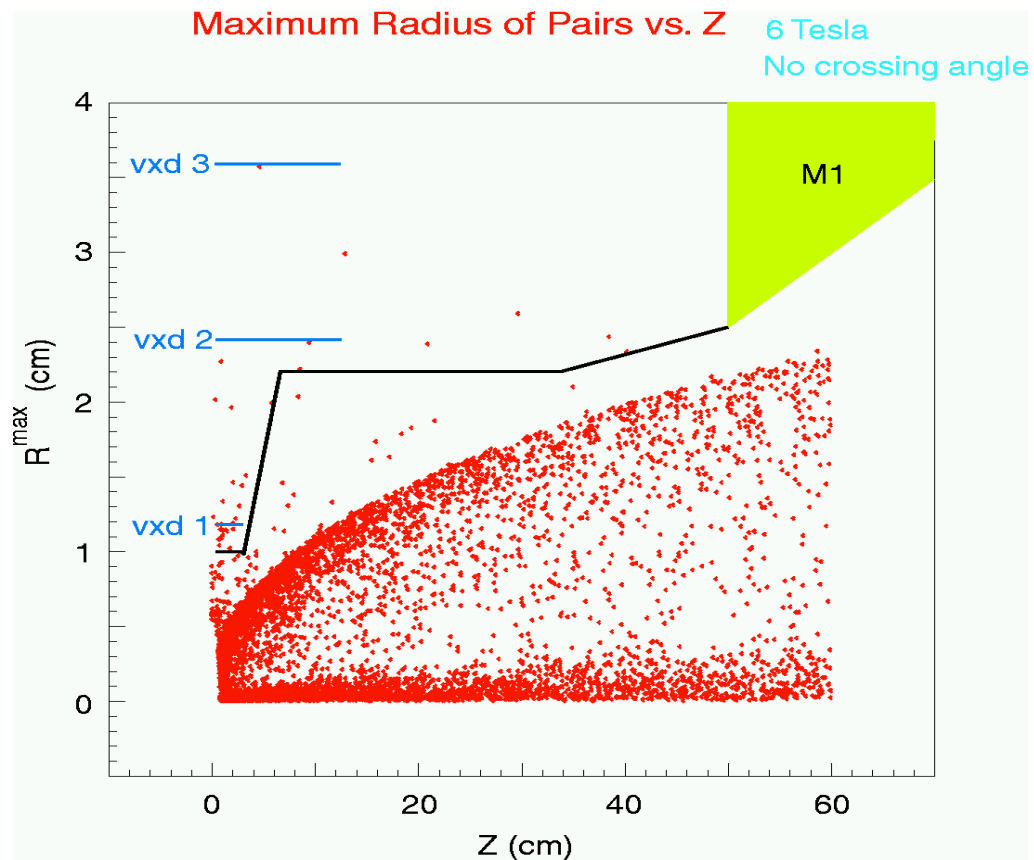
- Will need to read several input streams to get physics event, beamstrahlung, two photon, etc.
- Overlay of background particles' tracks need to be shifted in space in the TPC according to their bunch number.
- Need to combine cal hits from different inputs.

# Background numbers @500Gev CM

- Each bunch Xing produces  $\sim 20\text{K}$   $e^+e^-$  pairs.
- It takes  $\sim 1/2$  hr to generate *one bunch* Xing,
- $\sim 3$ hrs to simulate *one bunch* Xing in LCD.
- Thus, using a brute force approach *each* physics event has  $\sim 4\text{M}$  background particles which take  $\sim 300$ hrs of cpu for LCD simulation and 1/2Gbyte for storage.
- The physics event itself takes only 2mins to simulate in LCD and 0.2Mbytes for storage.

# B field to the rescue

- Almost all beamstrahlung misses LCD.



# Strategy

- Generate only one set of 95 Guinea Pig bunch Xings and excise particles that will miss LCD.
- For *each* physics event, take the entire set of 95 reduced GP bunch Xings and make small random shifts in each particle's momenta then simulate in LCD.
- This reduces background cpu and storage requirements to be comparable to what is needed for the physics event itself.

# Status

- 95 bunches of Guinea Pig events at 500Gev in CM have been produced.
- Almost ready to produce the L2 and S2 simulation of reduced and momentum randomized Guinea Pig bunch Xing sets.
- Need to create the JAS multi-stream reading, overlay and track shifting tools (some of this may be ready?)
- No work yet on two-photon or beam gas.