Simulations at NIU
A Status Report

Guilherme Lima

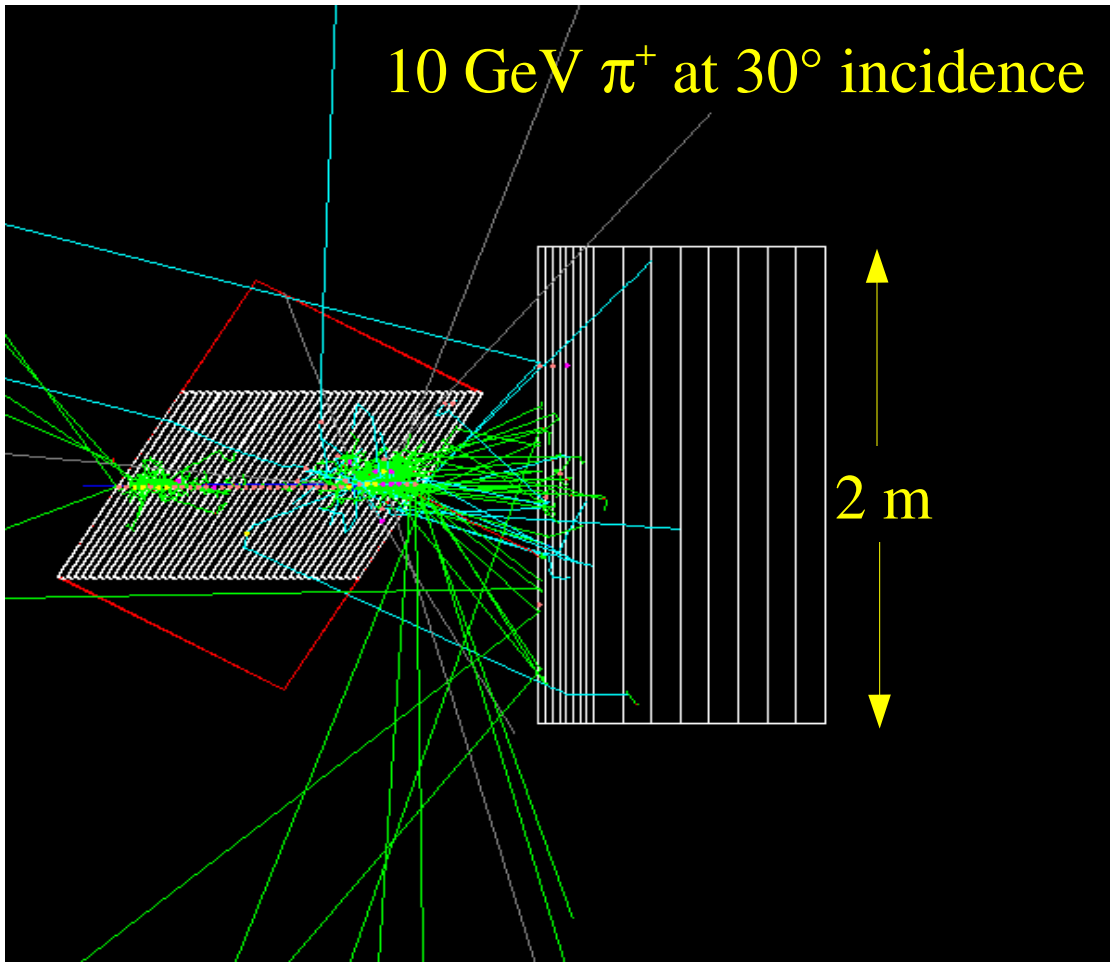
LC Calorimetry WG Meeting
June 21, 2004

Outline

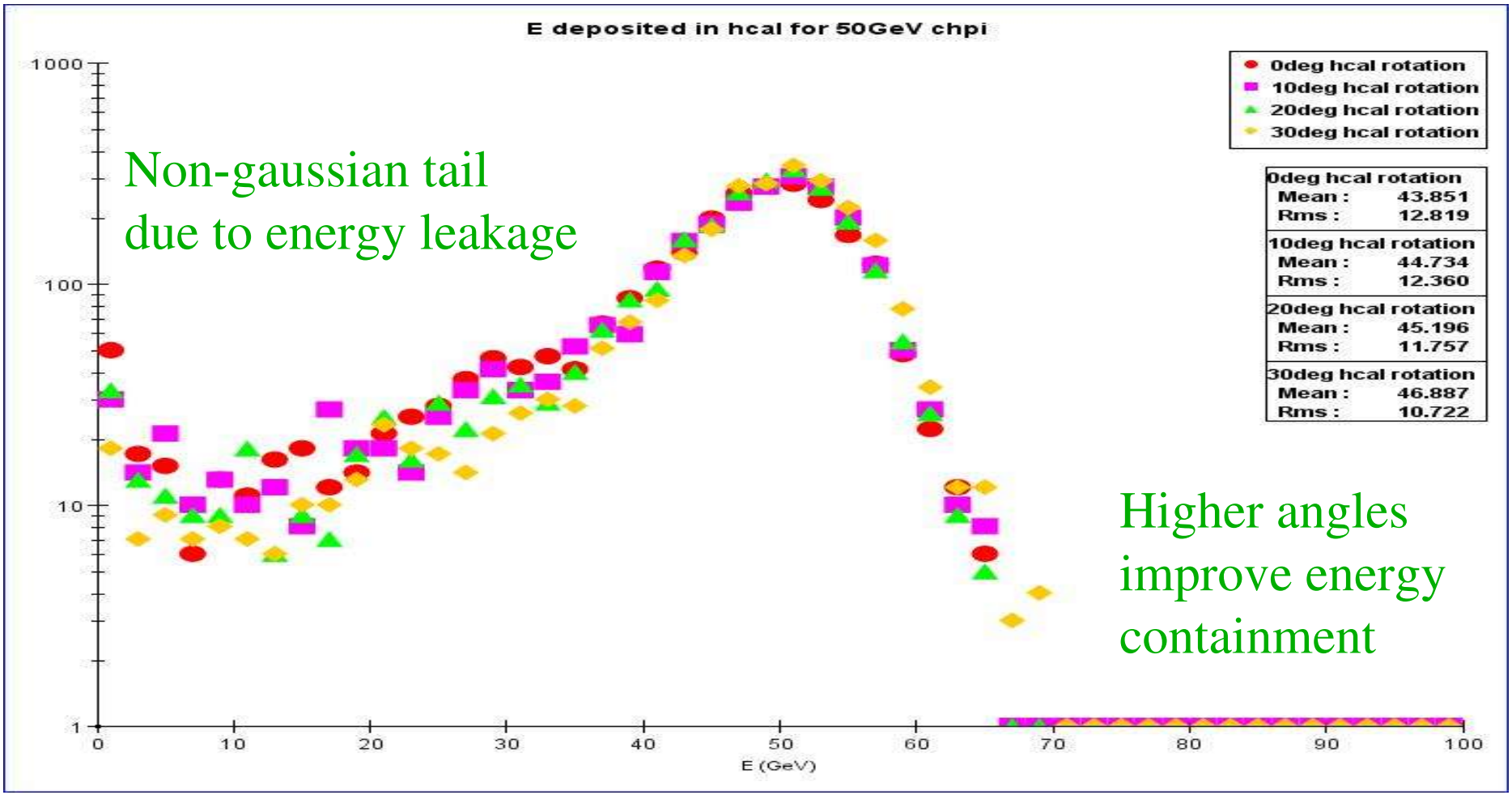
- Test beam:
  - Tail catcher studies
- LCDG4:
  - Bug fix: no hits from Z,W to leptons
  - Non-projective fork developments
  - What's next?

Test beam: tail catcher studies

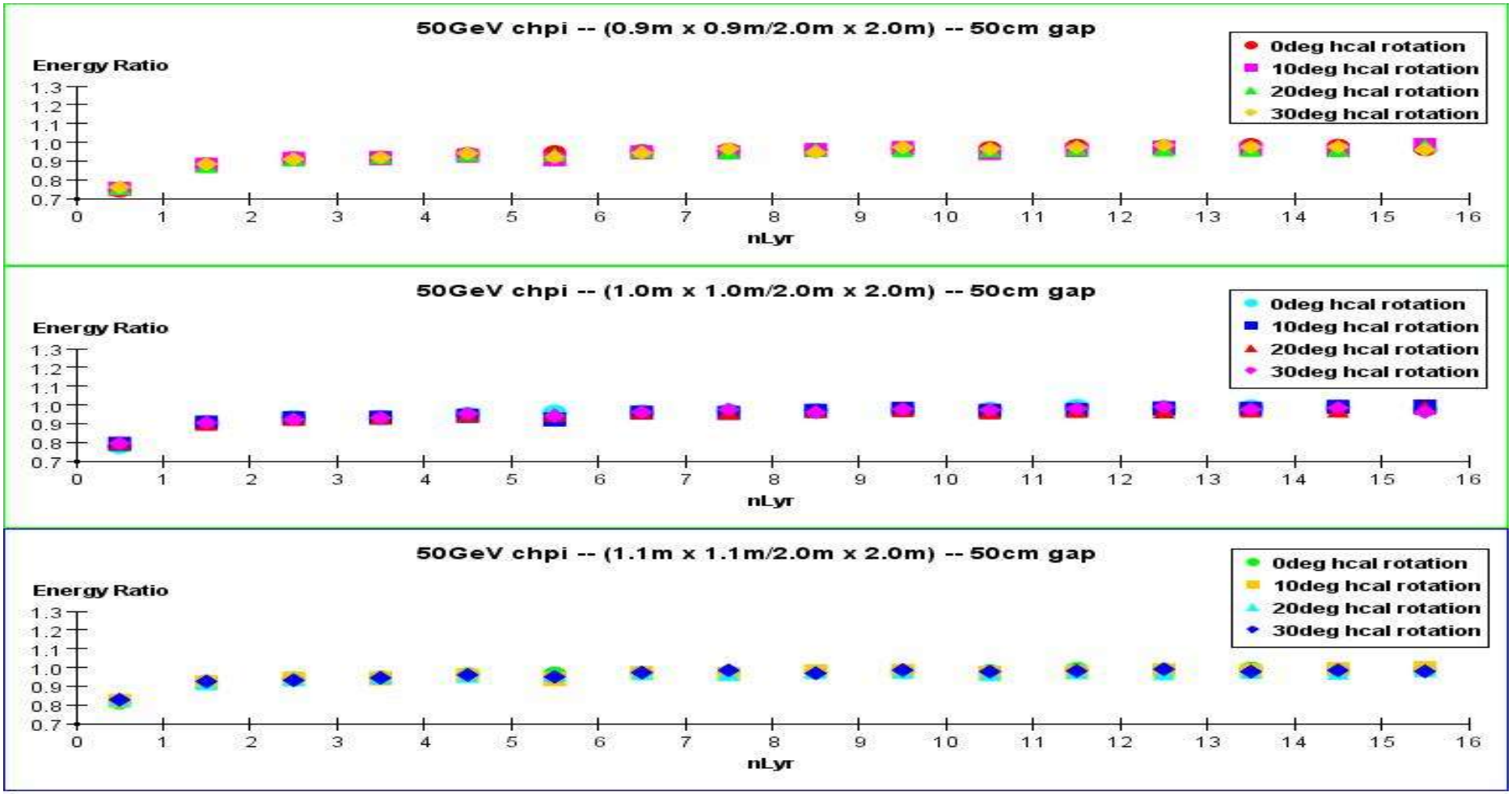
- Hcal table allows rotations of up to ~40 degrees
- How does these affect Edep in the tail catcher?
  Do we need more than a 1m-wide tail catcher?



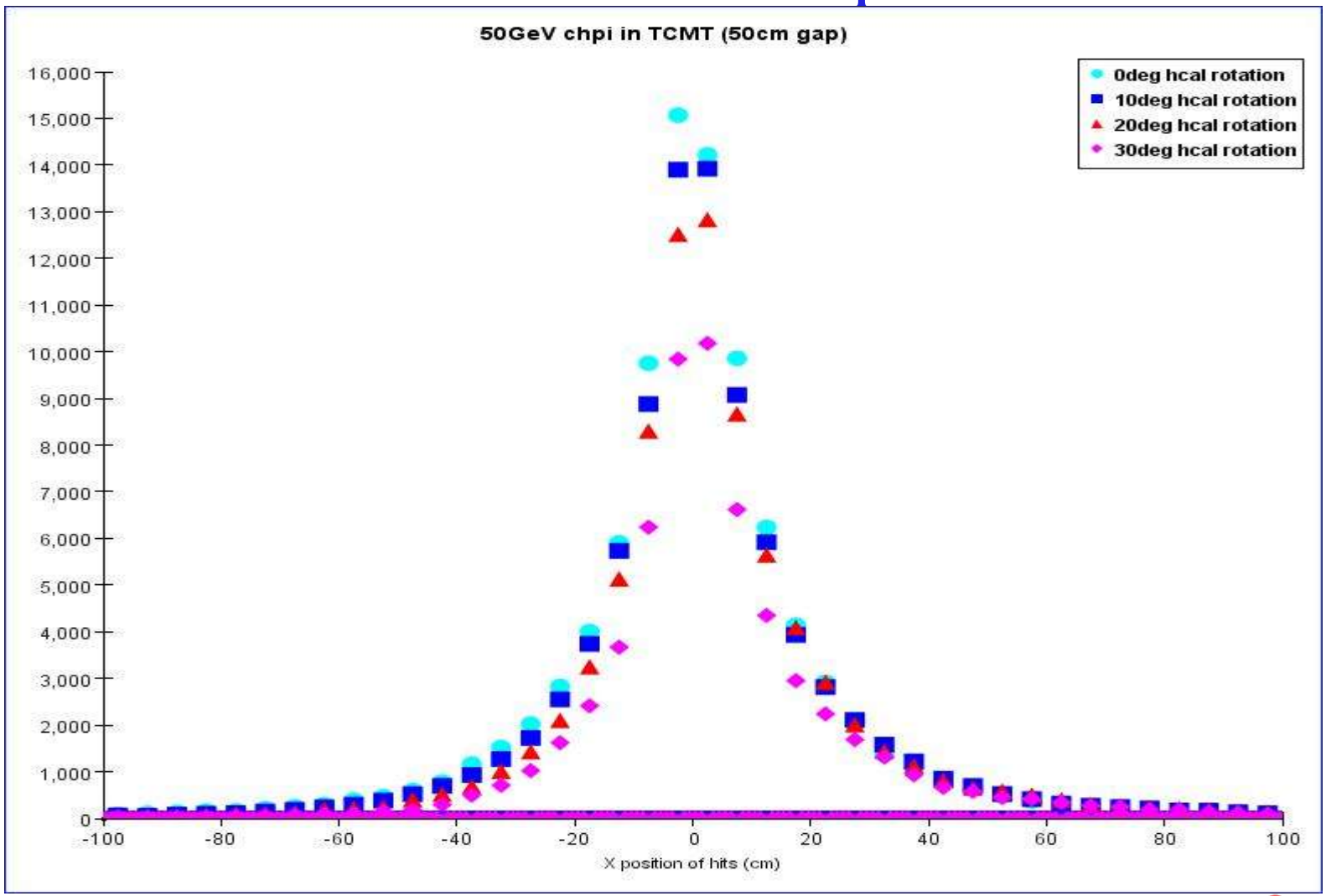
E_{reco} in Hcal – 50 GeV π^+



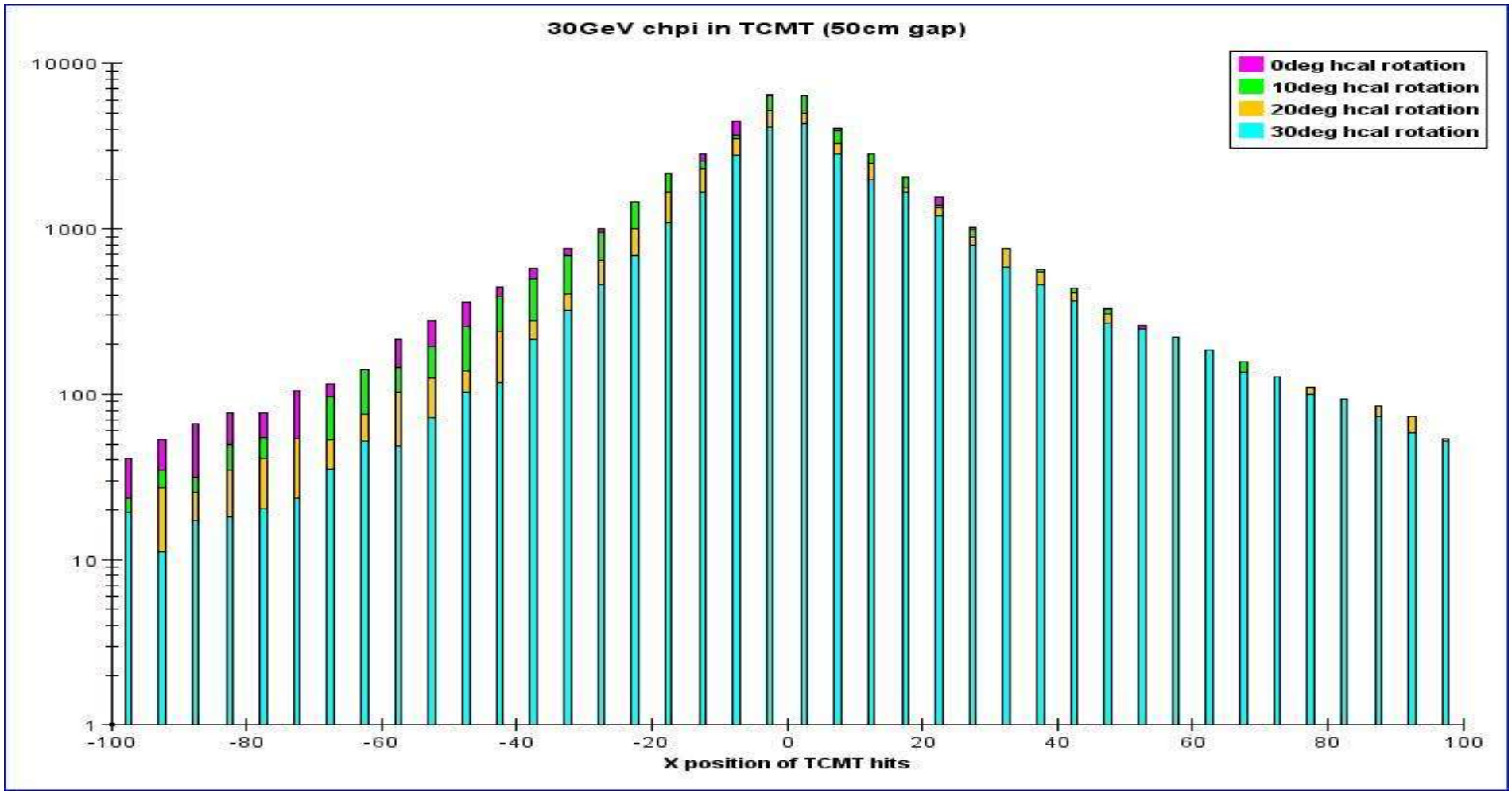
Do we need more than a 1m-wide TC?



Effect on shower x-position



Effect on transverse hit distribution



LCDG4: bug fix

- Norman Graf, Ron Cassell: LCDG4 bug
  Leptons from Z, W decays produced no hits
- Pandora-pythia: eetoWW, eetotautau, final state Ws and leptons have status `DOCUMENTATION`
- Fix: send all `DOCUMENTATION` particles with preassigned decays to Geant4 for simulation
- Released into NIU and SLAC CVS (version v02-29)
- Samples are available at NICADD server:
  10K $e^+e^- \rightarrow W^+W^-$ and 10K $e^+e^- \rightarrow \tau^+\tau^-$ events

LCDG4: Non-projective developments

- LCDG4 geometry representation from XML files (only projective calorimeters)
- Non-projective HCal in LCDG4 (a fork)
  - Fixed cell sizes (rectangular shapes)
  - Changes: .dtd file, XML geometry *driver*, SensitiveDetector class (virtual cells), and new classes for NonProjective geometry
  - Implement a cell id schema, ok up to 2x2 mm^2 cells (32 bits in SIO format)

LCDG4: Merge Proj and NonProj versions

- Easier maintenance
- Eliminate a lot of duplicated code (inheritance)
- Bonus: ability to do non-projective ECal as well
- Changes also needed in lcd.hep (T.Johnson et.al.)
- This is work under way (almost ready)

LCDG4: So what's next?

- Some things on the list:
  - (1) Conclude non-projective merge (including hep.lcd)
  - (2) Understand NHits bump in the transition from ECal to HCal
  - (3) LCIO format
  - (4) Define Geant4 regions for finer simulations (rangecut 1um in ECal?)
  - (5) More realistic geometries (boxes with arbitrary translations and rotations)
- LCS already has (3) and (4) (right Ron?). Combining efforts for (5) is probably a good idea
- Possible LCDG4 contributions: non-projective geometry and maybe correct treatment of preassigned decays