# Software Coordinator's Report

F.Gaede, DESY

ILD Meeting

02.Oct.2018

# Outline

- Generator
- Simulation
- Reconstruction
- Monte Carlo Production

# Generator M.Berggren

- sent patches for minor issues to Whizard authors
  - fixing stable quarks in 6 jet events
  - redundant duplication of some output lines removed
- patches accepted by Whizard authors
  - to be tested w/ new release
- created new samples for JER studies w/ Whizard2
  - uds events + additional cc, bb events
  - investigation of consistency w/ old samples ongoing

# Simulation D.Jeans, S.Lu

- ongoing study of Geant4 settings for pair-bg (and full physics) simulations
- effect of settings for B-field stepping on:
  - hit creation
  - MCParticle endpoints
  - tracking efficiency

## Tuning Geant4 Configuration

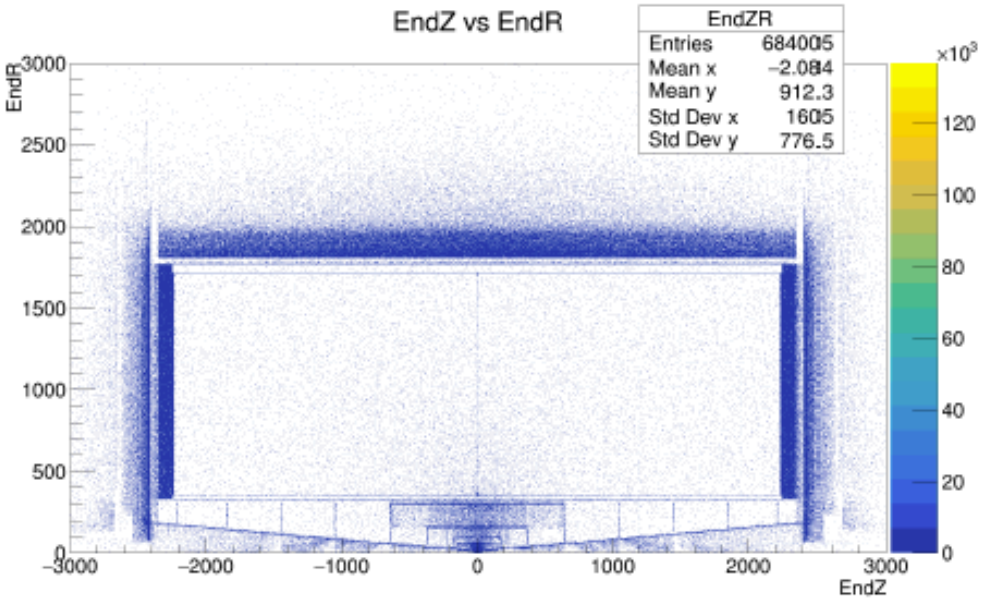
```
################################################
## Configuration for the magnetic field (stepper)
################################################
## --- used in v01-19-05 :
##SIM.field.delta_chord = 1e-05
##SIM.field.delta_intersection = 1e-05
##SIM.field.delta_one_step = .5e-03*mm
##SIM.field.eps_max = 1e-04
##SIM.field.eps_min = 1e-05
##SIM.field.equation = "Mag_UsualEqRhs"
##SIM.field.largest_step = 10.*m
##SIM.field.min_chord_step = 1.e-2*mm
##SIM.field.stepper = "HelixSimpleRunge"

## ---  default values in ddsim
SIM.field.delta_chord = 0.25
SIM.field.delta_intersection = 0.001
SIM.field.delta_one_step = 0.01
SIM.field.eps_max = 0.001
SIM.field.eps_min = 5e-05
SIM.field.equation = "Mag_UsualEqRhs"
SIM.field.largest_step = 10000.0
SIM.field.min_chord_step = 0.01
SIM.field.stepper = "G4ClassicalRK4"
```

**"delta_chord" effect or MC particles endpoint and tracking accuracy**

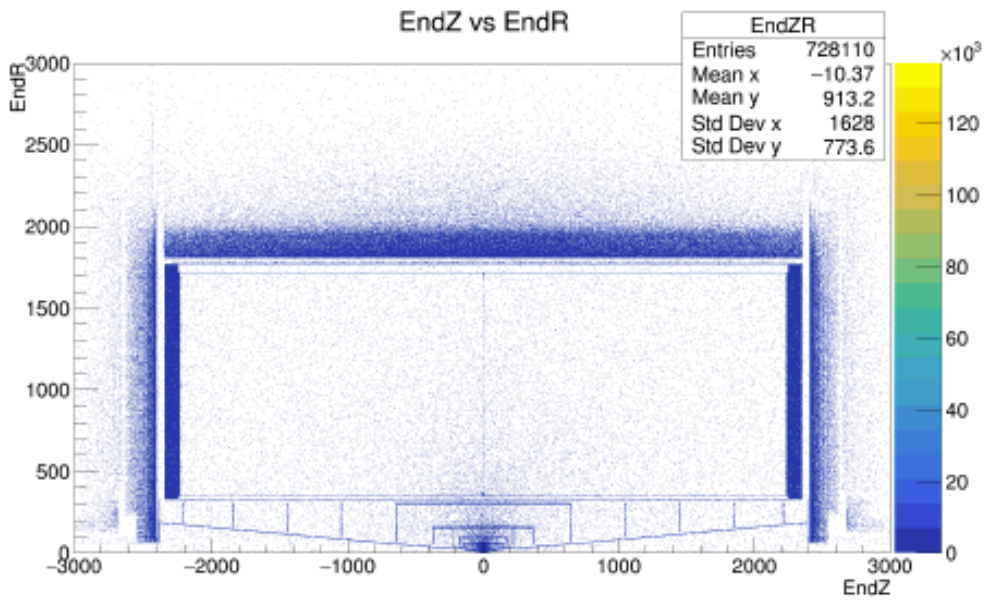
***Effect may come from potential combination Not yet studied***

# Simulation D.Jeans, S.Lu

**endpoint of MCParticles:**




**delta_chord = 1e-5 mm**

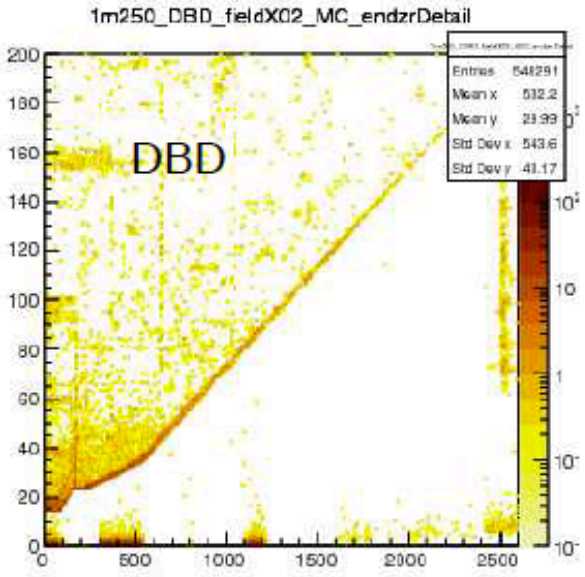


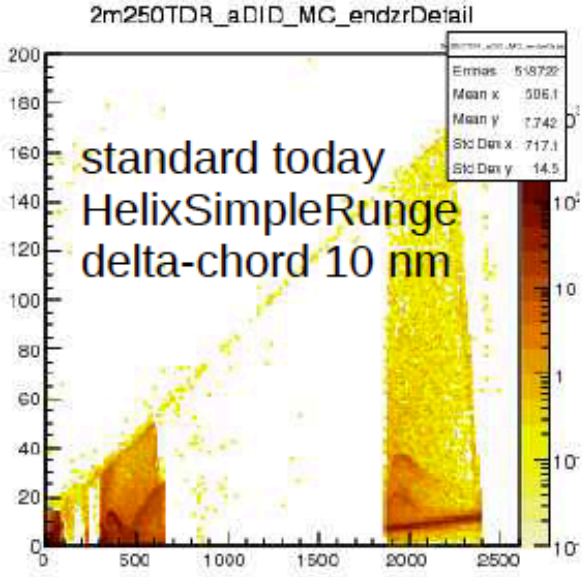

**delta_chord = .25 mm**

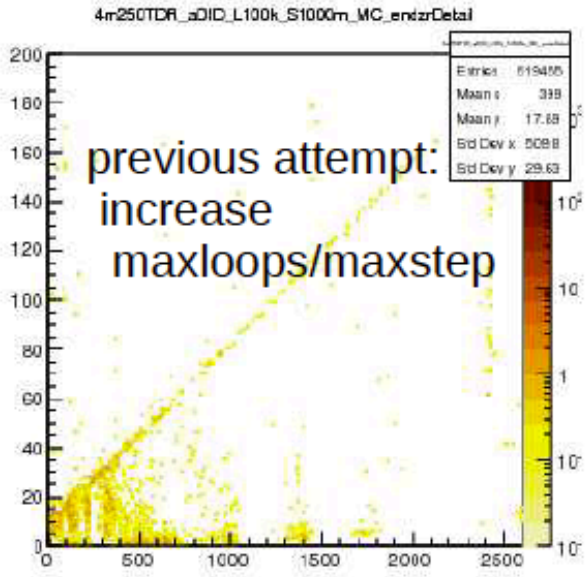
- set a small delta_chord value for the main production
  - needed to prevent a crash in Geant4
  - believed to be necessary for more accurate tracking
- causes (low energetic) particles to be stopped early
  - interplay w/ max_loops,max_steps (see next slides)

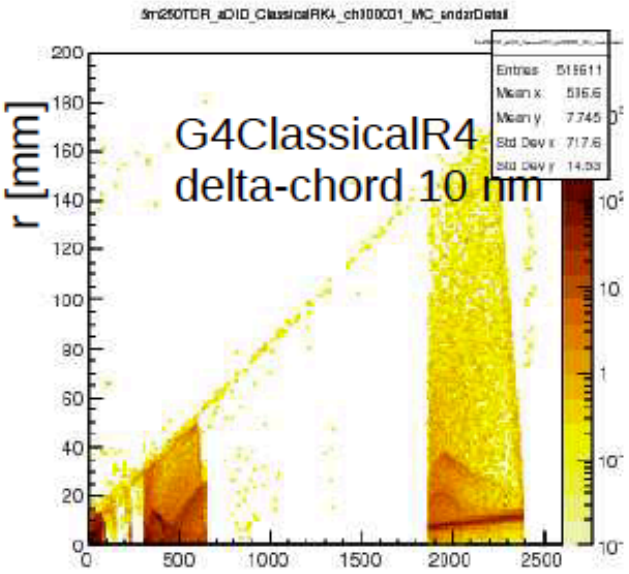
# Endpoints (z-r) of MC particles

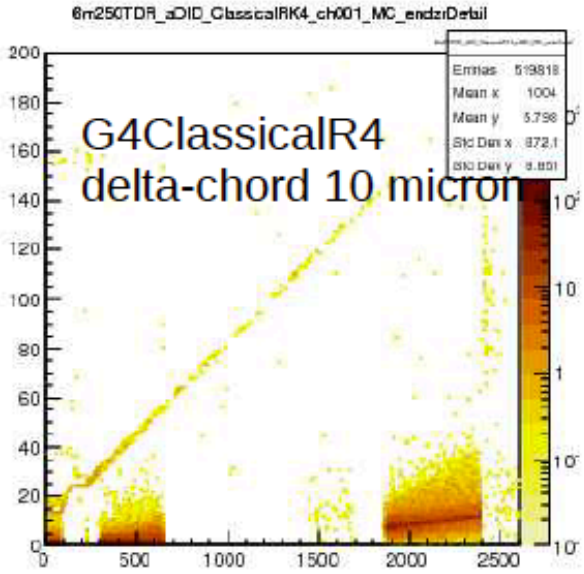
D.Jeans

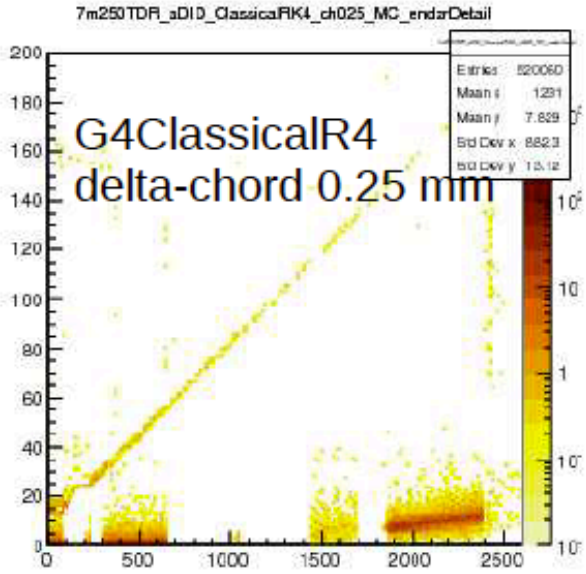


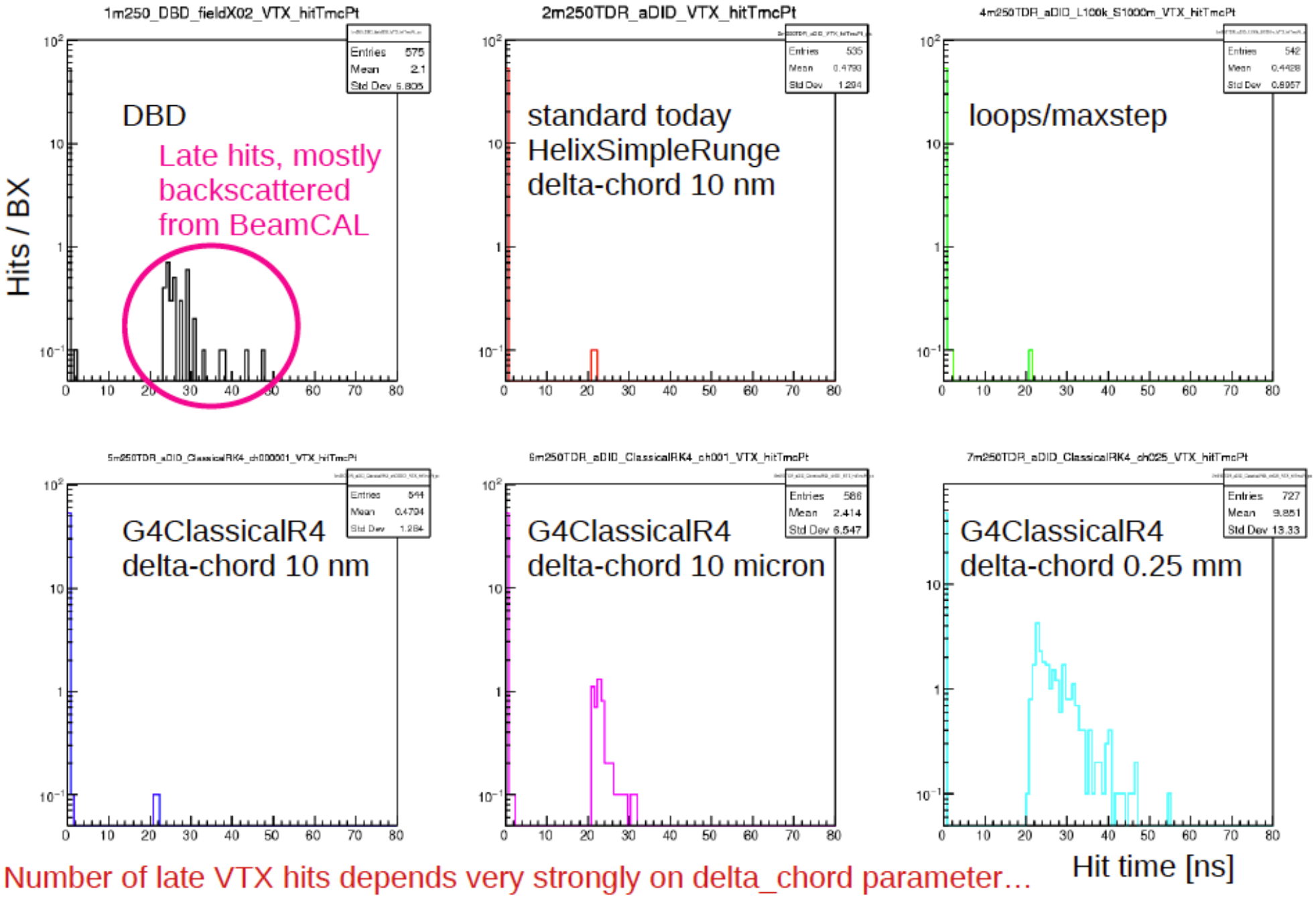




Z [mm]

# Simtrackerhits in vertex detector: hit time

D.Jeans

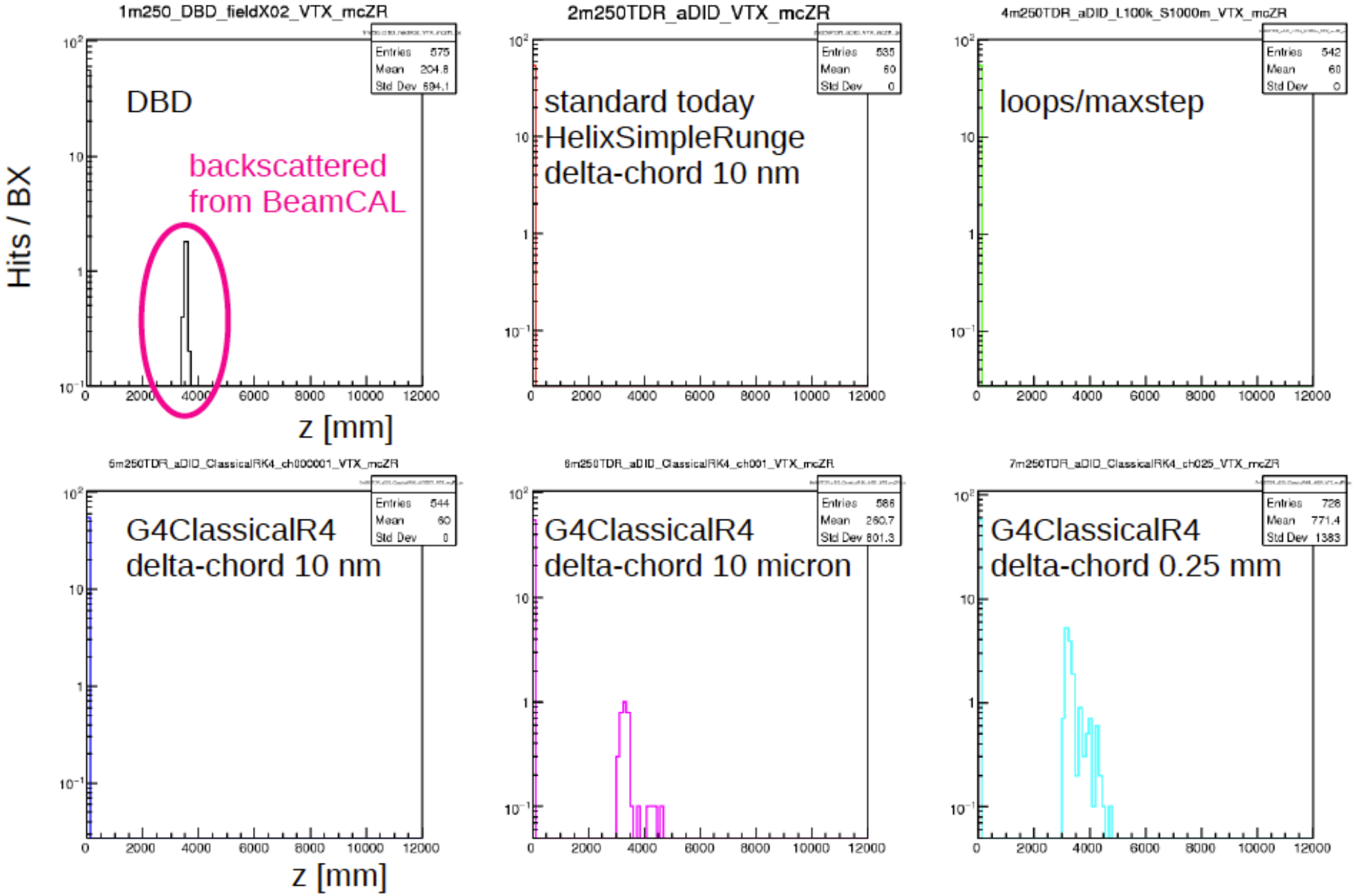



Number of late VTX hits depends very strongly on delta_chord parameter…

May explain recent observation of “reduction” in backscattered hits in VTX

# Production position (z) of MCparticles creating VTX hits

**D.Jeans**

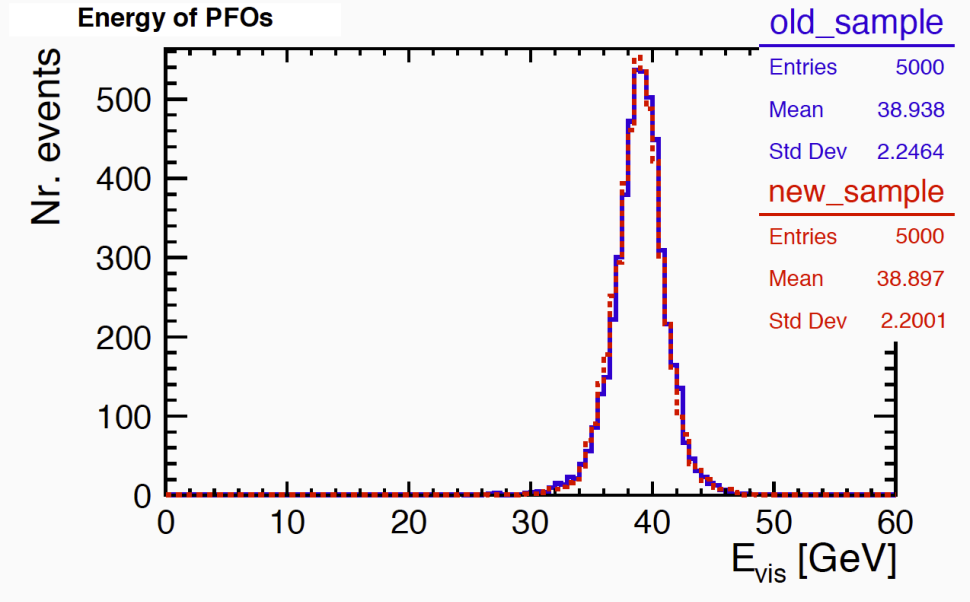


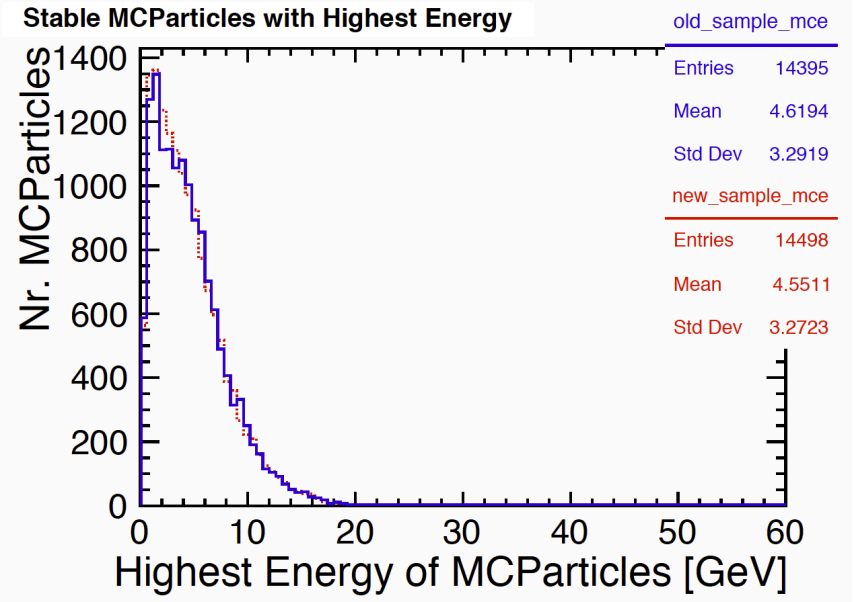
# Simulation D.Jeans, S.Lu

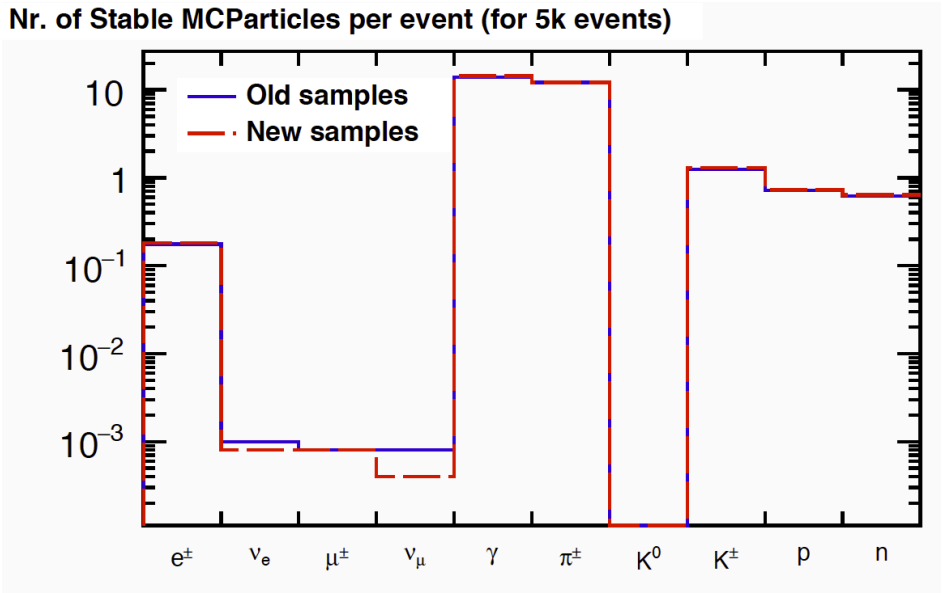
- Summary of current studies:
  - interplay of a number of parameters control the tracking/stepping of low energetic particles in Geant4
  - this is particularly important for pair-bg simulations and the estimation of occupancies
  - **previous findings that the amount of Vertex hits from backscatter (BeamCal region) is small might be pre-mature**
  - **further studies needed !**
  - NB: so far no issues observed for track reconstruction in main production

# Reconstruction

Y.Radkhorrami



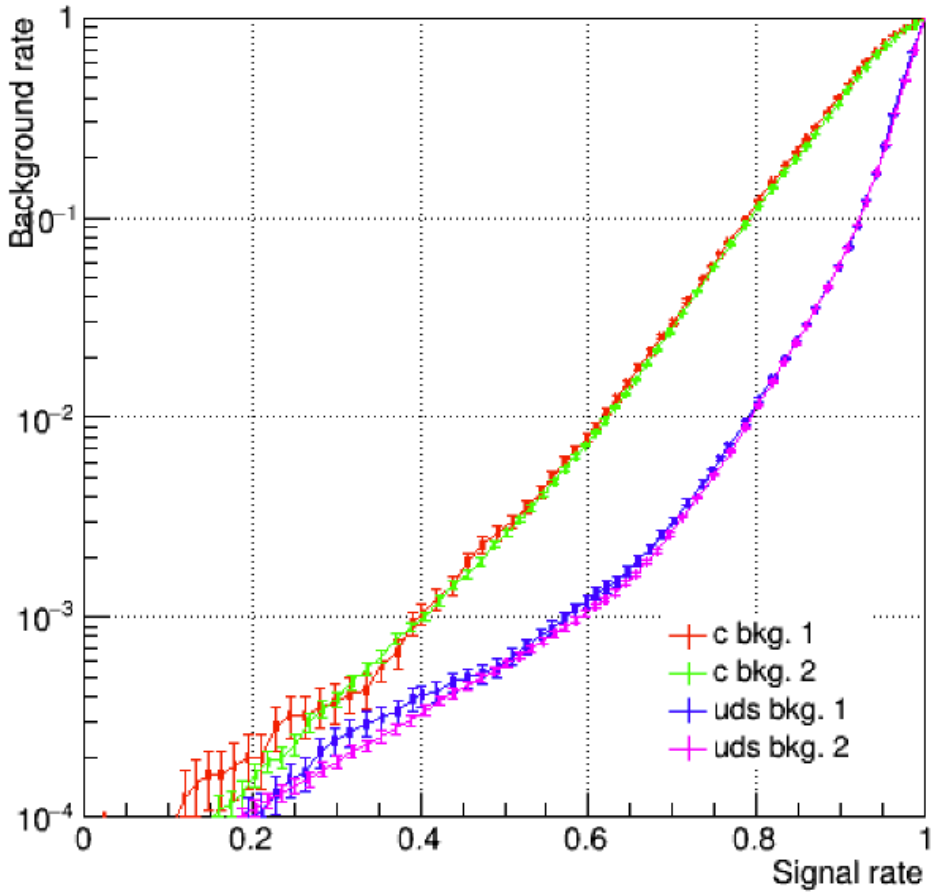




- checking consistency of new Whizard2 di-jet samples for JER studies
- so far no inconsistencies found
- plan to investigate also JER for cc,bb jets

# Reconstruction

## fixed issue in LCFIPlus




## Reported by Ryo Yonamine

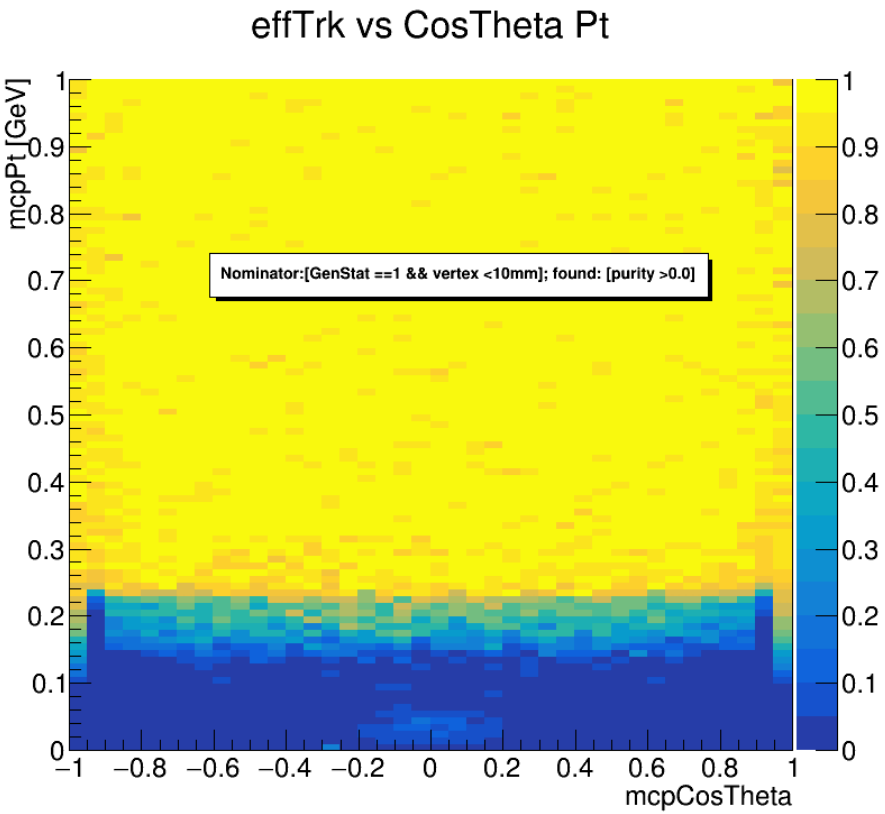
- Primary vertex error issue has been solved.
- Statistical dependency became much smaller.

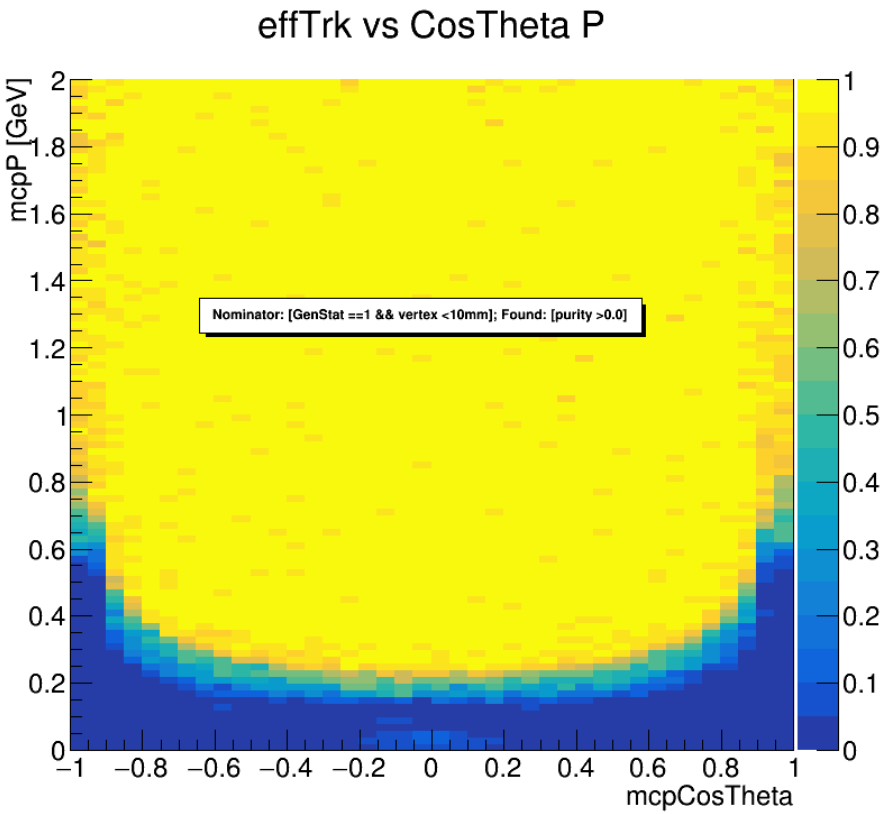
**+ : 20k w/ new fix (c bkg)**
**+ : 100k w/ new fix + MaxDepth=6 (c bkg)**
**+ : 20k w/ new fix (uds bkg)**
**+ : 100k w/ new fix + MaxDepth=6 (uds bkg)**

**Best : using 100k w/ MaxDepth=6**

# Reconstruction

S.Lu




- started to study tracking efficiency
  - as function of cos(theta) and (transverse) momentum
- 2D plots reveal additional behaviour of tracking efficiency

# Monte Carlo Production

**A.Miyamoto, H.Ono**

- last missing production *benchmark* sample nunuqqqq @ 1TeV has now been produced
- all benchmark samples are now available:
  - SIM, REC, DST files:  desy-SE
  - DST-merged: desy-SE, KEK-SE
    - /pnfs/desy.de/ilc/prod/ilc/mc-opt-3/ild/dst-merged/
    - on the DESY NAF
- **Monte Carlo production for the IDR is completed**

# Summary & Outlook

- the Monte Carlo mass production for the ILD-IDR has been finished successfully
- work continues on
  - simulation settings for pair-bg studies
  - reconstruction: HLR tools (flavour tagging, PID,…)
- focus has now shifted to prepare the detector performance plots for the IDR
  - will continue to support the *benchmark* analyses
- will meet in Arlington for the **ILD Benchmarking Days** (Oct 19-21) in Arlington