Geant4 Simulations

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ALICE Offline Week

Call for Geant3/Geant4 Comparison
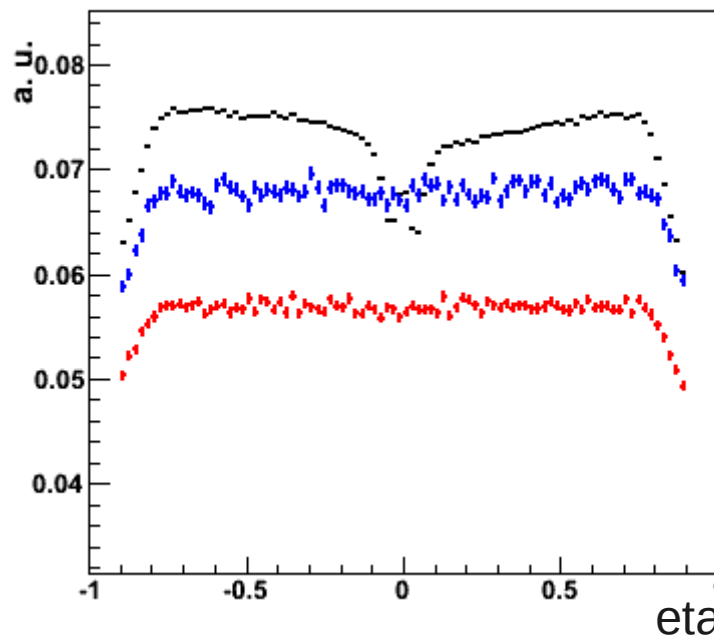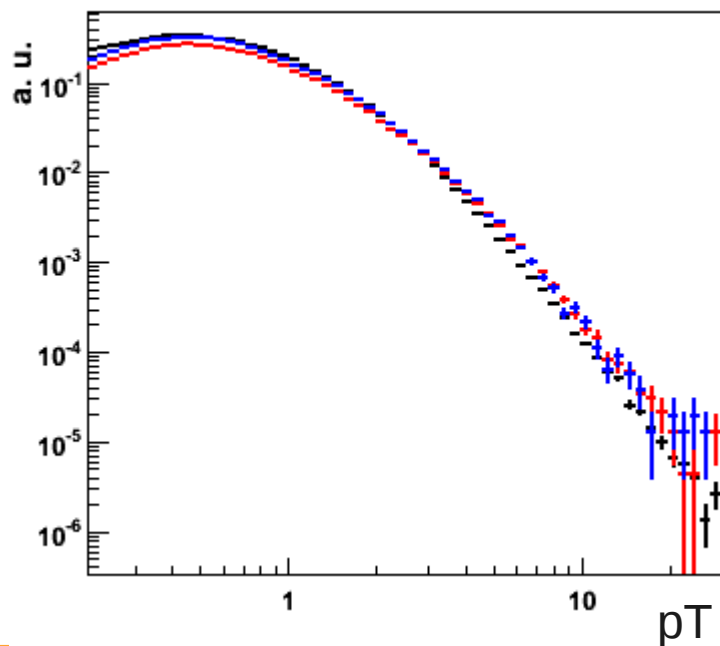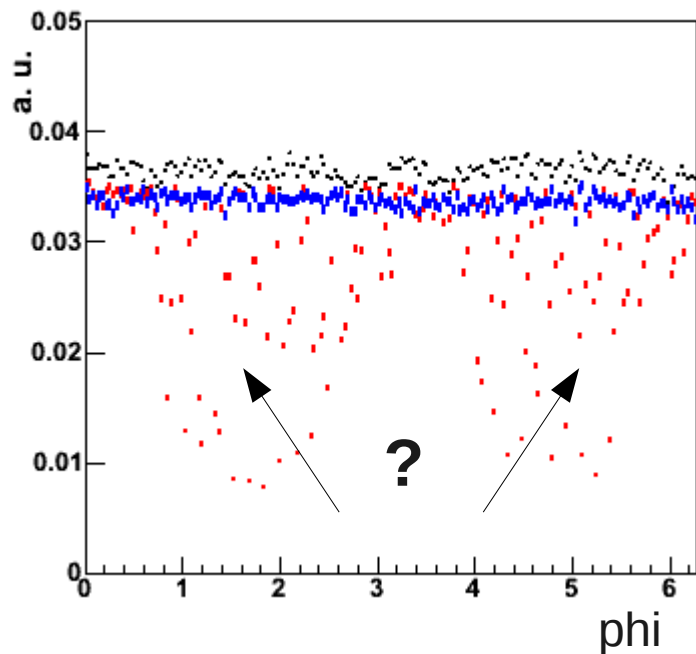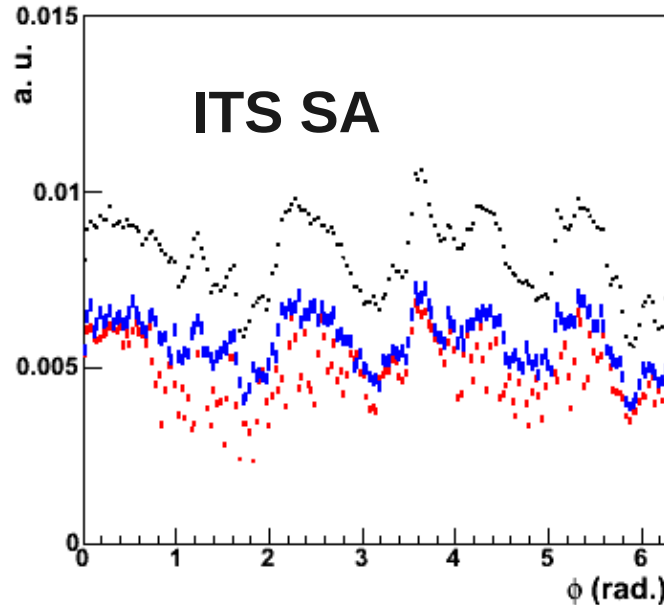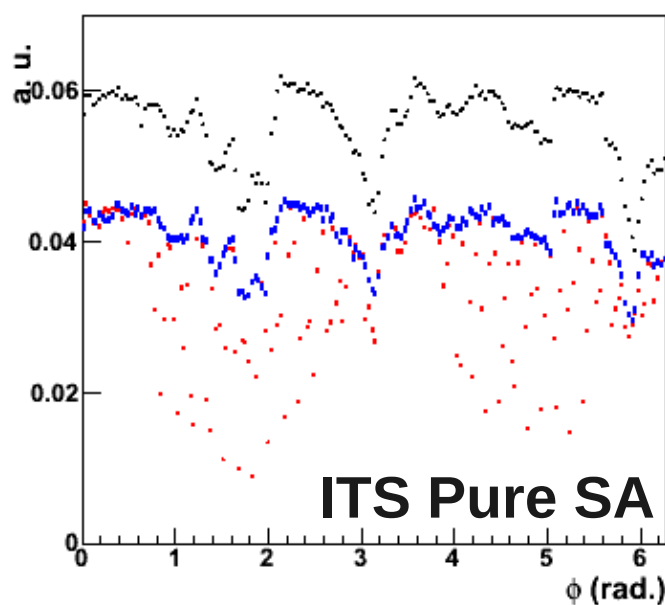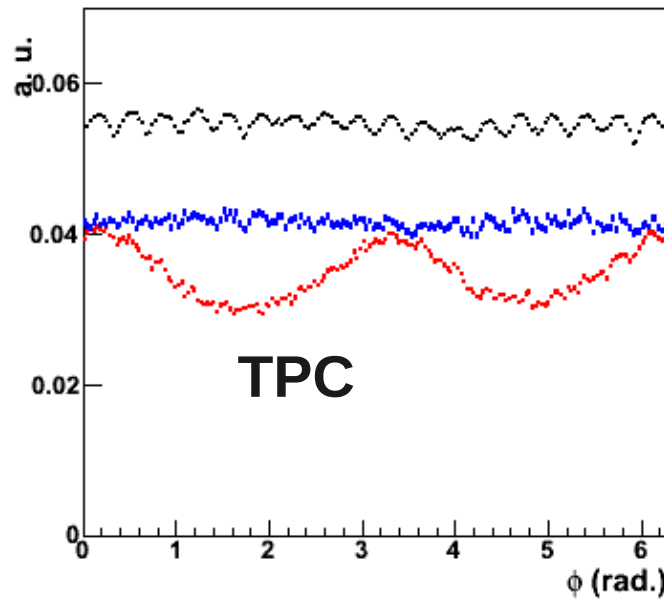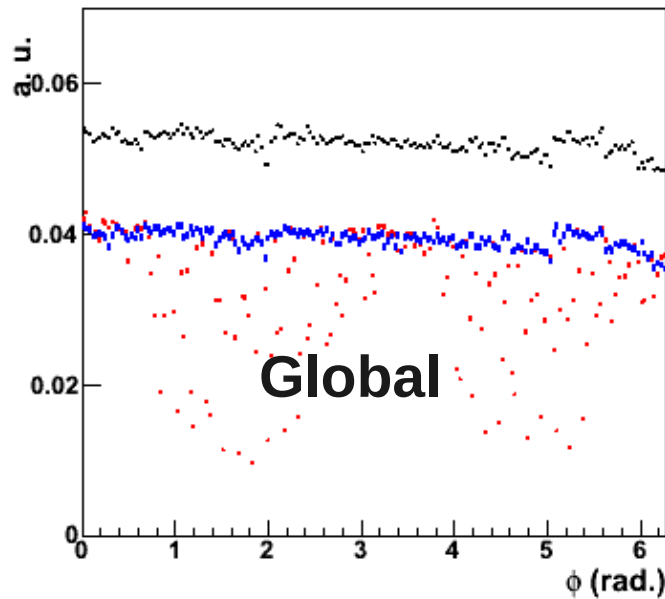
- 2 new productions were run in February including fixes found during last productions:

  – LHC11a5a: Geant4 (Physics list: QGSP_BERT_EMV+optical)

  – LHC11a5b: Geant3

    – ROOT v5-27-06b and AliRoot v4-20-Rev-10, same OCDB
    – Anchor run LHC10d 126007 (and 126008)
    – Pythia Perugia-0, 7 TeV,
    – 500,000 event each (real 3M)

- Call for Comparison:

  – QA train (#51): almost done

  – Data sets on CAF: - /alice/sim/LHC11a5a_000126007 (for Geant4)
     - /PWG4/esicking/LHC11a5b_126007_G3 (for Geant3)
     - /PWG4/esicking/LHC10d_000126007_p2 (for real data)

  – Hits, (S)Digits, RecPoints were saved, too → Detailed comparison on all levels is possible.

Properties of Global Tracks

real

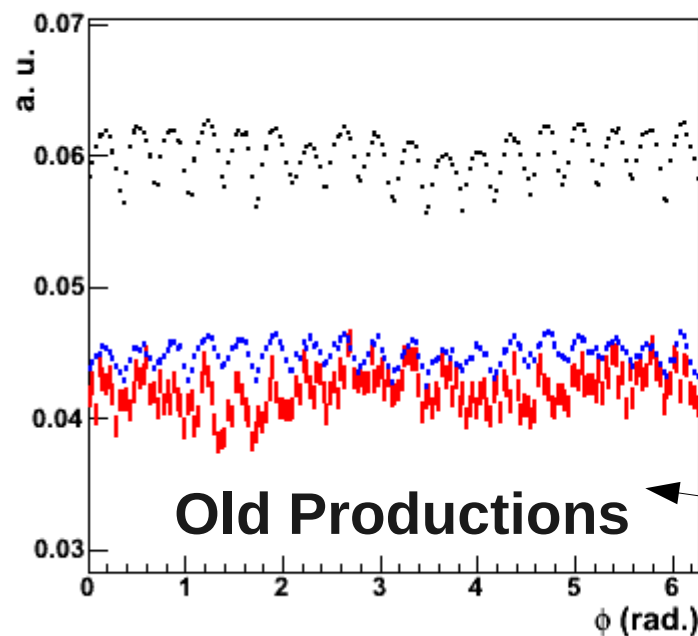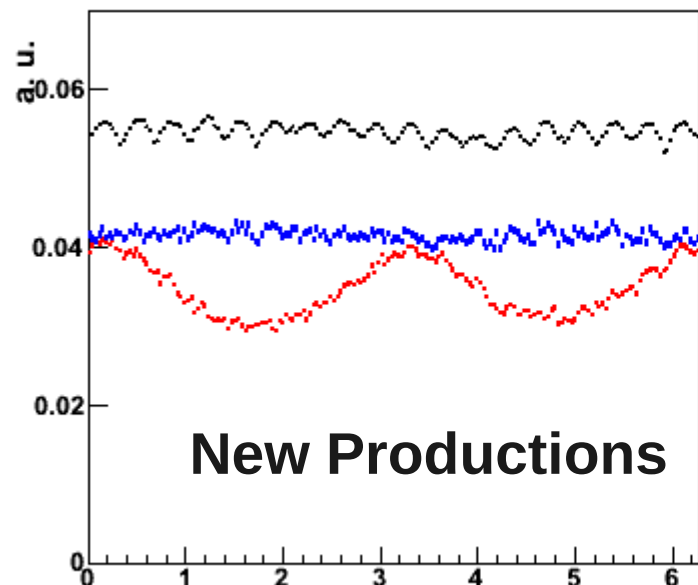**Geant4 (QGSP_BERT_EMV+opt)**

Geant3

Phi of Different Tracks

- All tracks connected to TPC tracks show modulation in phi

- Dips in ITS phi distribution for Geant4

  may be geometry problem. In certain phi, all tracks are stopped during tracking

New Productions
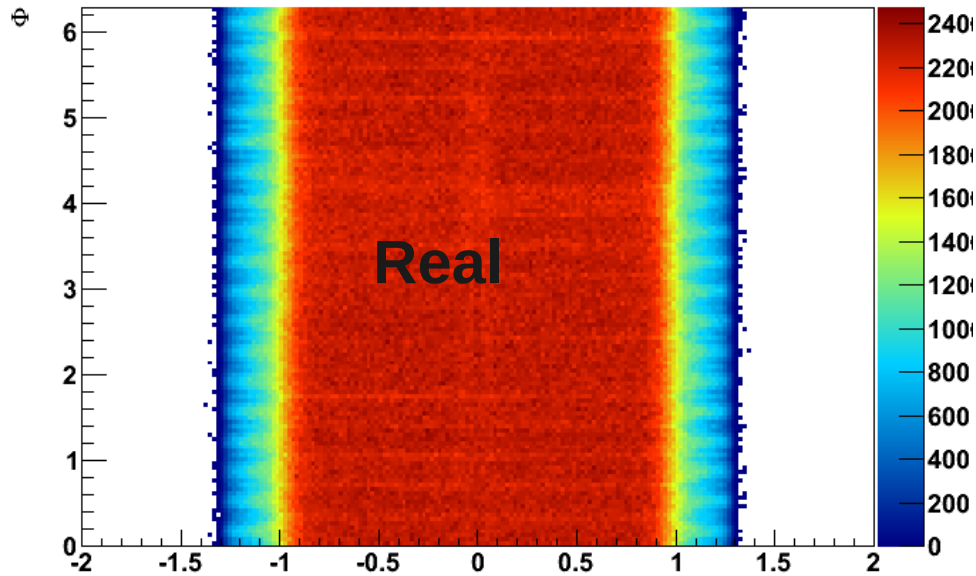
Old Productions

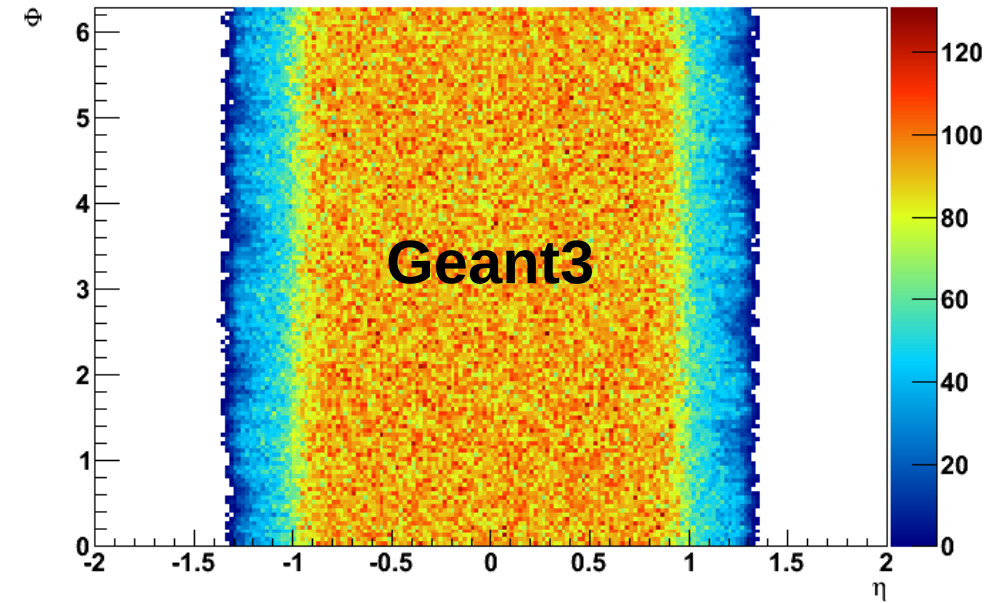— **real pass 2**

— **Geant4**

— **Geant3**

- Last production did not show this strong modulation, but little modulation was visible already here

- Where do we loose the tracks? Check cuts!

From last productions, Anchor run 119846, LHC10c11 (same PL)
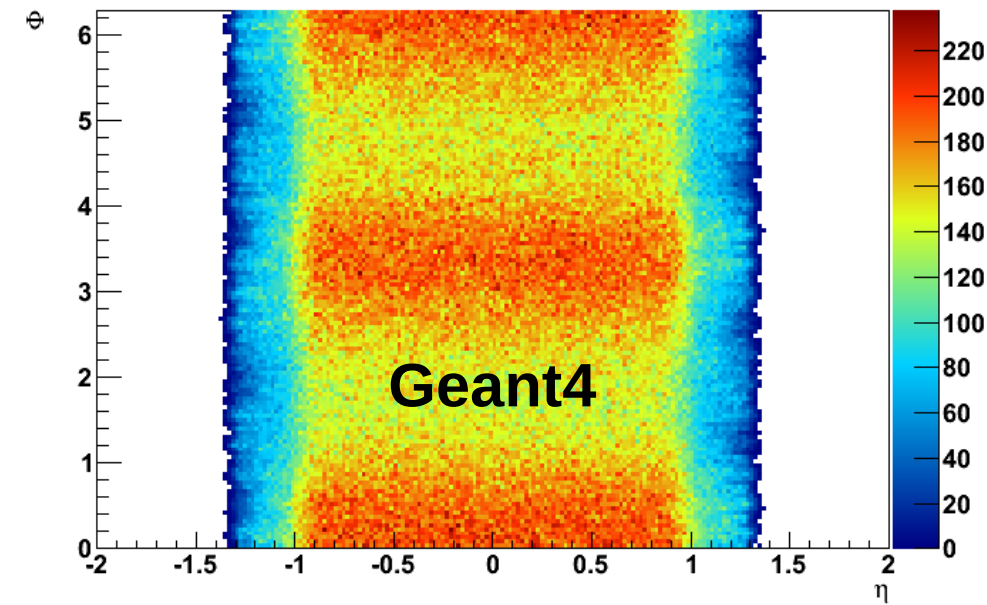
TPC: Phi-Eta

- First check:
  - There is no modulation in eta for the Geant4 data

TPC: Phi-DCA
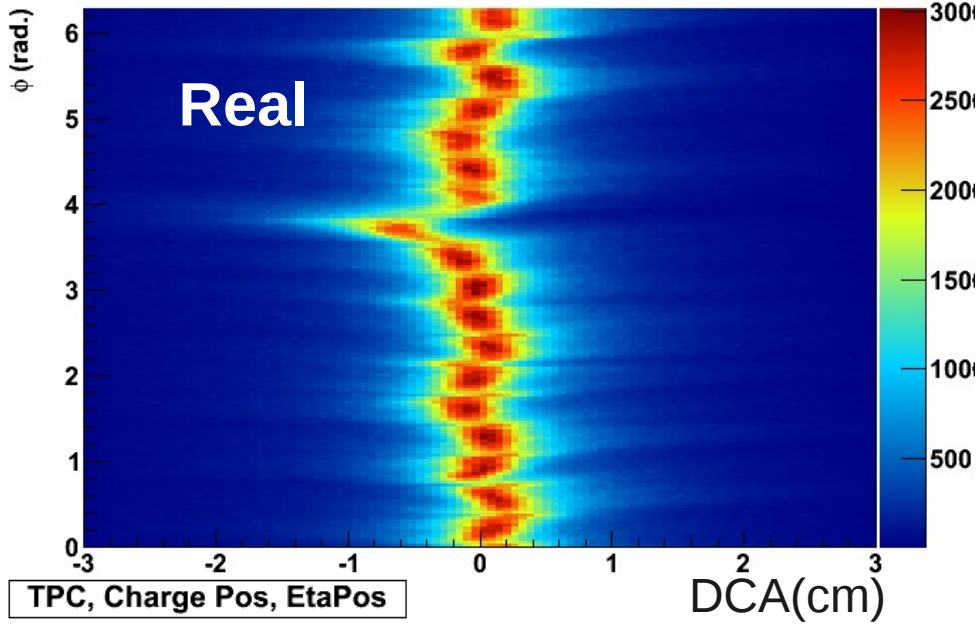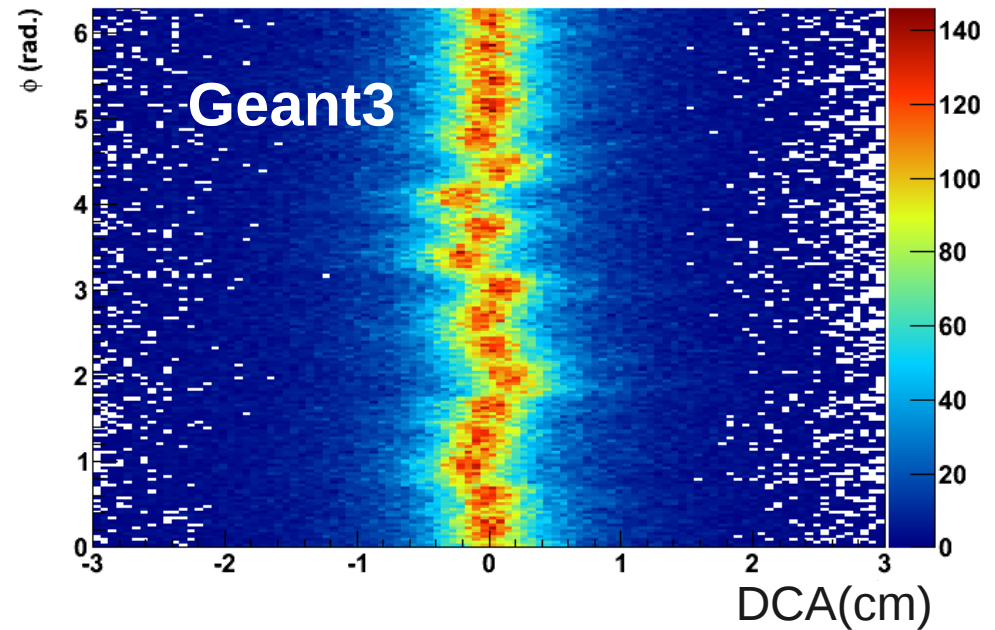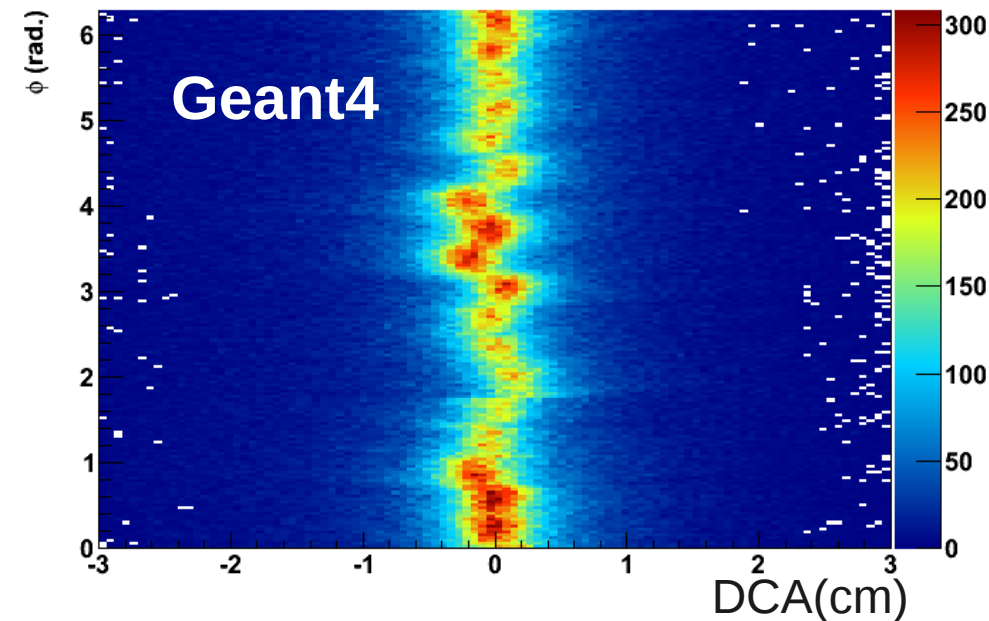
- No visible difference in DCA distributions, only less entries for some phi ranges

- Check Number of Clusters

TPC: Phi - Number of Clusters
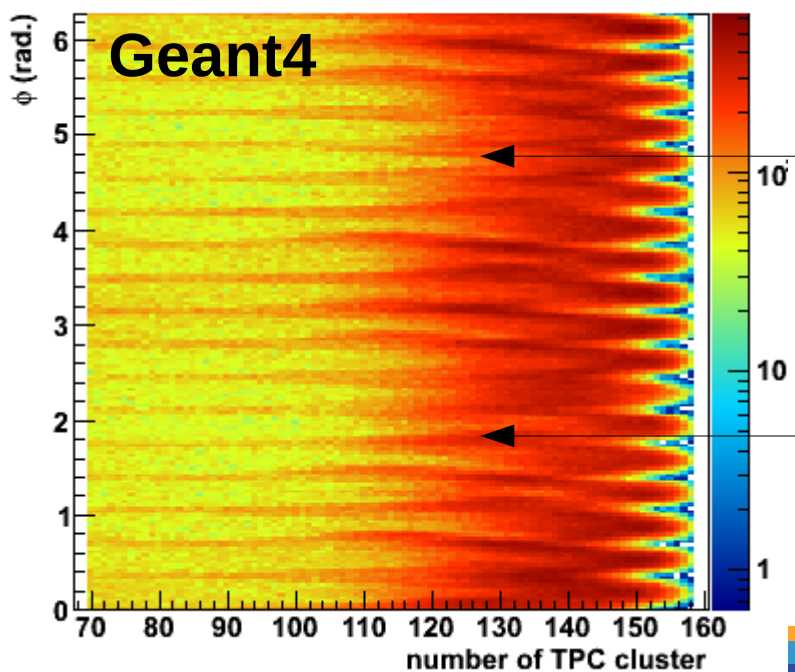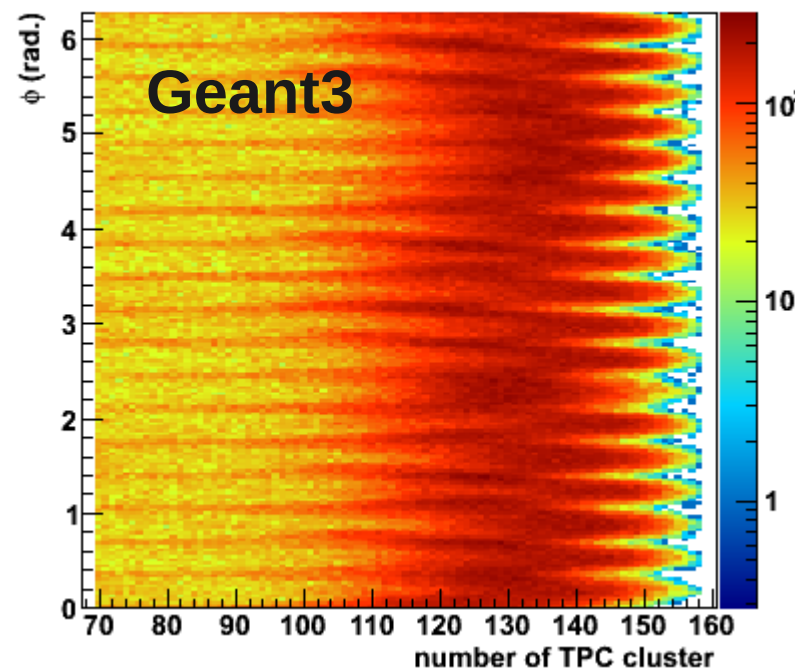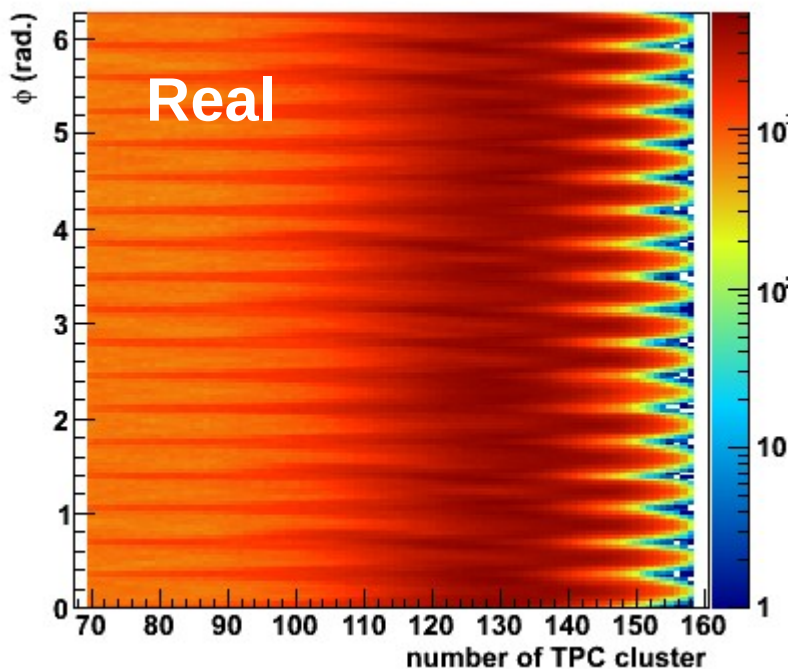
- At phi=1.5 and phi=4.7, less tracks with intermediate number of tracks (NCL~120)

- Why only here?

- Help of TPC experts is needed
  - Check earlier steps (Digits...)

Hits in ITS layer - Phi

Real
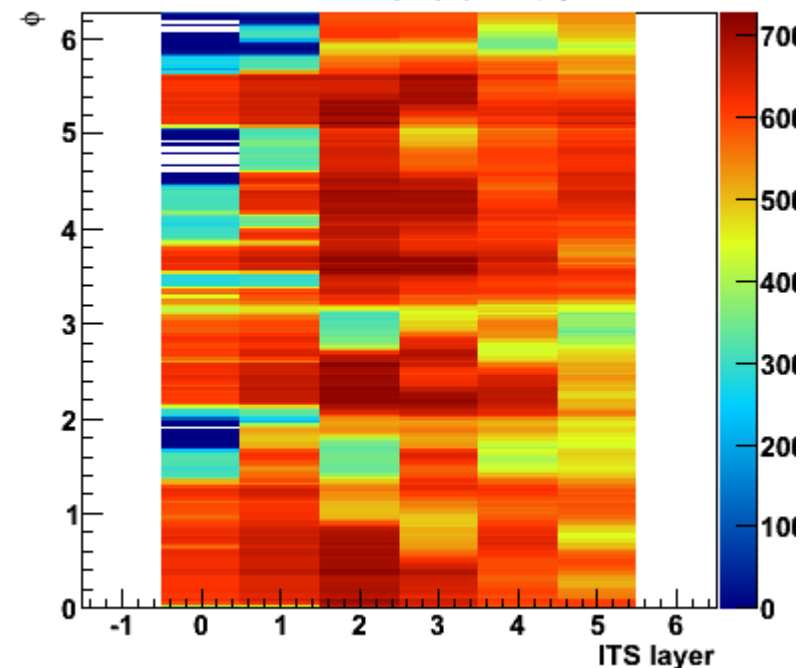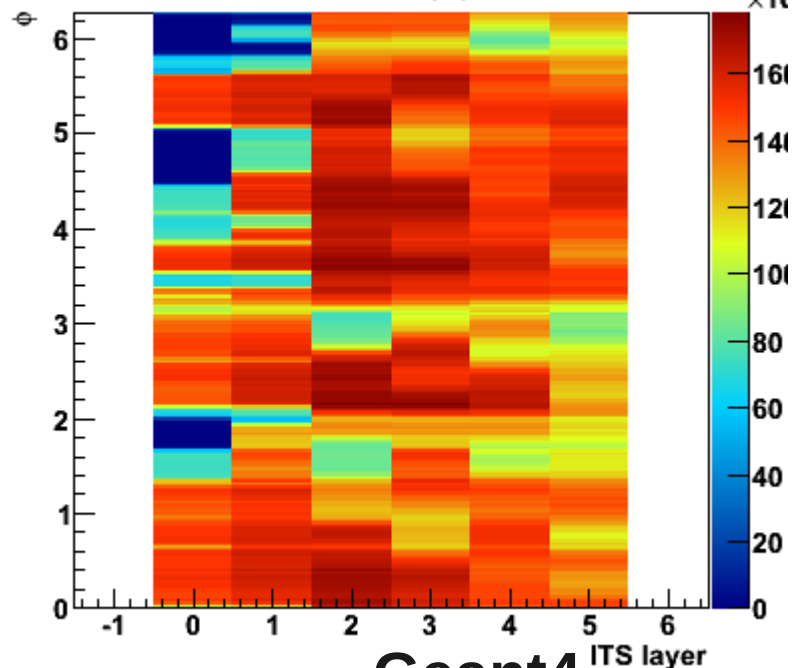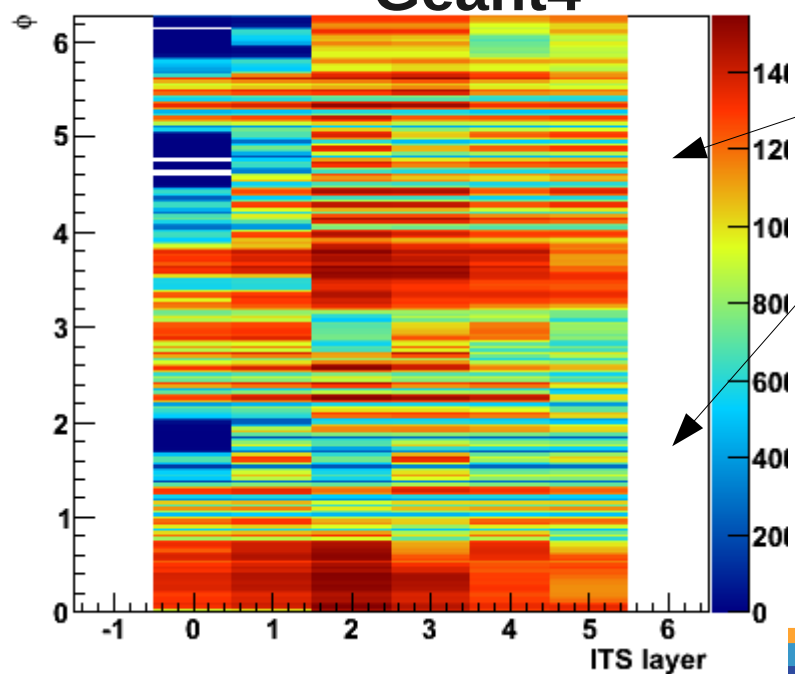
Geant3

Geant4

- On top, modulations from TPC tracks (Pure SA tracks are tracks from global tracking)

- In addition, dips in phi: tracks are lost somewhere during tracking, all layers affected, source maybe in SPD

Summary

- New productions for Geant3/Geant4 comparison including several bug-fixes from last iteration

- New data: Global checks of tracks

  - TPC shows less tracks in some phi ranges

  - ITS looses tracks at small phi windows

- Experts of all detectors:

  - Please check the data and give feedback

  - All data, also simulation output (Hits, Digits...) are available for detailed tests

News from Geant4 and VMC

I. Hrivnacova, IPN Orsay

ALICE Offline Week, 7 – 11 March, CERN

Geant4

- Last releases:
  - 9.4. - since December 2010 – among other new features provides a transport of anti-nuclei;
  - See the release notes:
    - http://geant4.web.cern.ch/geant4/support/ReleaseNotes4.9.4.html
  - + patch01 – since February – it includes an important fix in the EM physics builder (G4EmStandardPhysics_option1) which is used in the QGSP_BERT_EMV physics list (used in ALICE test simulations)
  - Development tag: geant4-09-04-ref-02 – since last week
    - Improvements in anti-nuclei physics; available for testing
- Update of ALICE packages on the GRID:
  - Replace GEANT4::v9.4_vmc.2.11 with GEANT4::v9.4.p01_vmc.2.11
  - Add new GEANT4::v9.4.ref02_vmc.2.11

VMC, Geant4 VMC

- ◆ VMC:
- ◆ A cleanup in the TVirtualMC interface in Root this week
  - ✛ Removing obsolete G3 style visualization functions
- ◆ With this update is in Root, geant3 (and geant4_vmc) will have to be updated to trunk version (in order to work with Root trunk)
  - ✛ New version of geant3 (and geant4_vmc) will be tagged when a new Root development tag is available
- ◆ Geant4 VMC:
- ◆ Last release: v2.11
  - ✛ Only migration to Geant4 9.4, no new features or fixes
- ◆ Pending problems:
  - ✛ Warnings from geometry transport – may affect the simulation results !

Geant4 VMC, G4Root

- Steps in assemblies (should never happen):
  - `I-TGeoShapeAssembly::DistFromInside: Cannot compute distance from inside the assembly (but from a component)`
  - Code to facilitate debugging added in geant4_vmc
- Tracking location wrong in G4Root.
  - A particle may end-up outside the setup giving the error message: "**No physical volume found at track vertex: (107635,-190901,-638802)**"
  - http://root.cern.ch/drupal/content/known-problems
- Particles not progressing in geometry:
  - **G4PropagatorInField::ComputeStep() - WARNING**

    Zero progress for 51 attempted steps.

    Proposed Step is 1.6314621044212e-05 but Step Taken is …

    For Particle with Charge = -1 Momentum = 76.60172992427 Mass = 0.51099891 in volume TPC_WSEG