



# TPC Hits in Mokka and MarlinReco

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# Introduction

- Readdress TPC hit production in Mokka
- Provide digitisation to produce Tracker Hits as input to tracking routines (LEPTracking, FullLDCTracking, Cheaters)
- TPC measures  $\phi$  and  $z(t)$  at fixed values of  $r$ , using pad-rings where  $r$  is defined as the radius at the centre of a pad

# Three different cases

- Almost all high Pt tracks cross through pad rings close to normal in r-phi
- Low Pt tracks (Loopers) can travel substantial distances within one pad ring
- Extremely low Pt tracks can travel completely within one pad ring due due to the very high B-Field

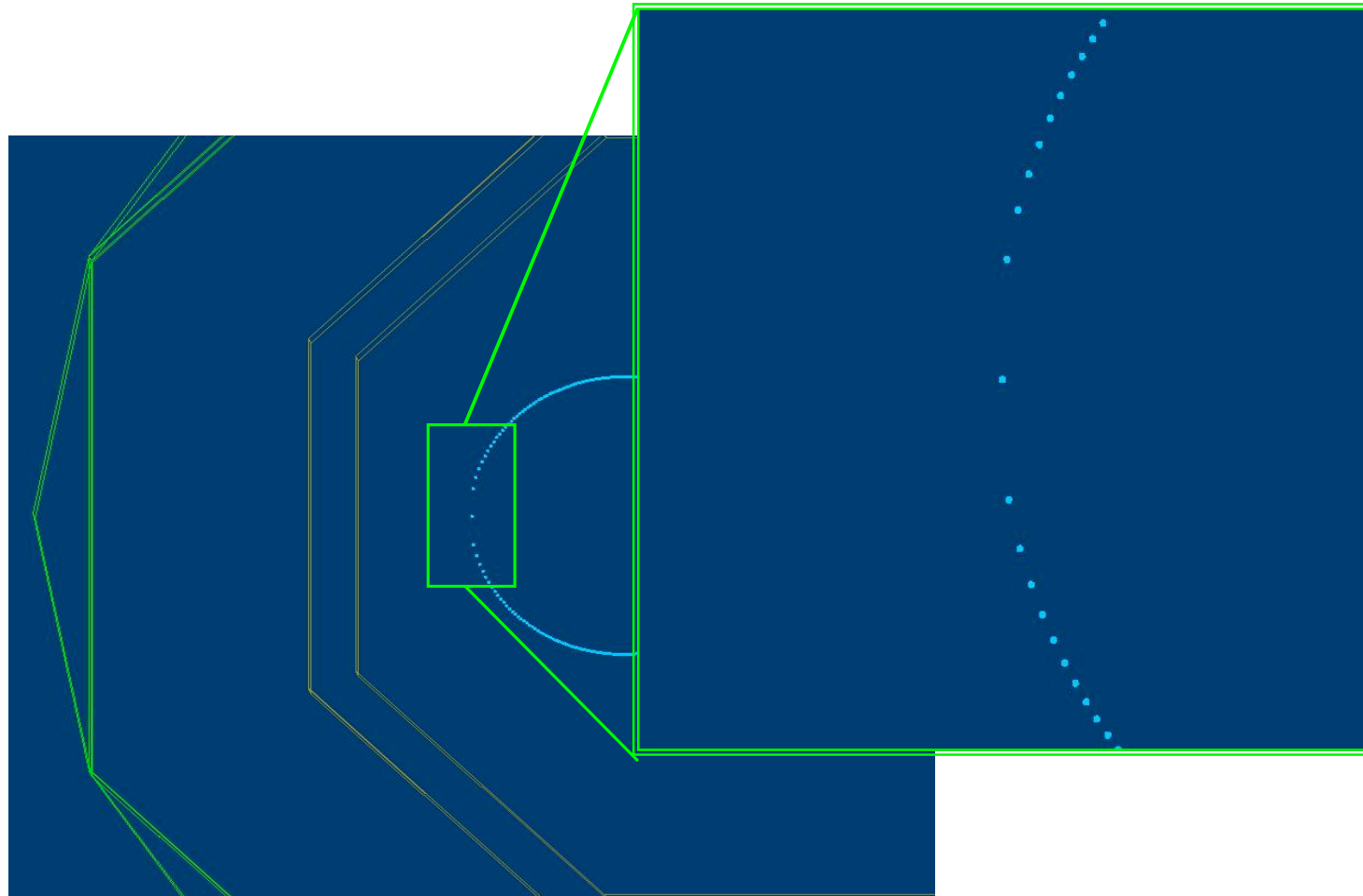
# Three different cases

- Hits will be determined from charge sharing between adjacent pads in the same pad ring
  - Accurate determination of  $\phi$  at fixed  $r$
- Large number of consecutive pads in one pad ring will record the same average charge
  - difficult to reconstruct, probably go to pixel approach
- Continuous arrival of charge on a few pads
  - background, will knock-out pads over period of time

# What is the problem

- LDC01-01Sc -- using tpc02
- created hits only when a track left a pad ring
- For low Pt tracks this caused large gaps between the hits

# What is the problem



# Partial Solution

- LDC01-02Sc -- tpc07 --TPC05 Driver, TPCSD01 Sensitive detector
- Creates a hit at the end of each G4 step, which have been limited in length by the user defined step-limit (default 5mm).
- Discrete physics processes will also cause the end of a step
- No more large gaps between hits

# Digitiser suffers

- Digitiser assumes hits are measurement of  $\phi$  at fixed  $r$
- Forced to interpolate the hit coordinate at the central radius of the pad ring
- For the sake of file size it is undesirable to save the 3-momentum of all hits in the TPC
- Leading to the creation of artefacts

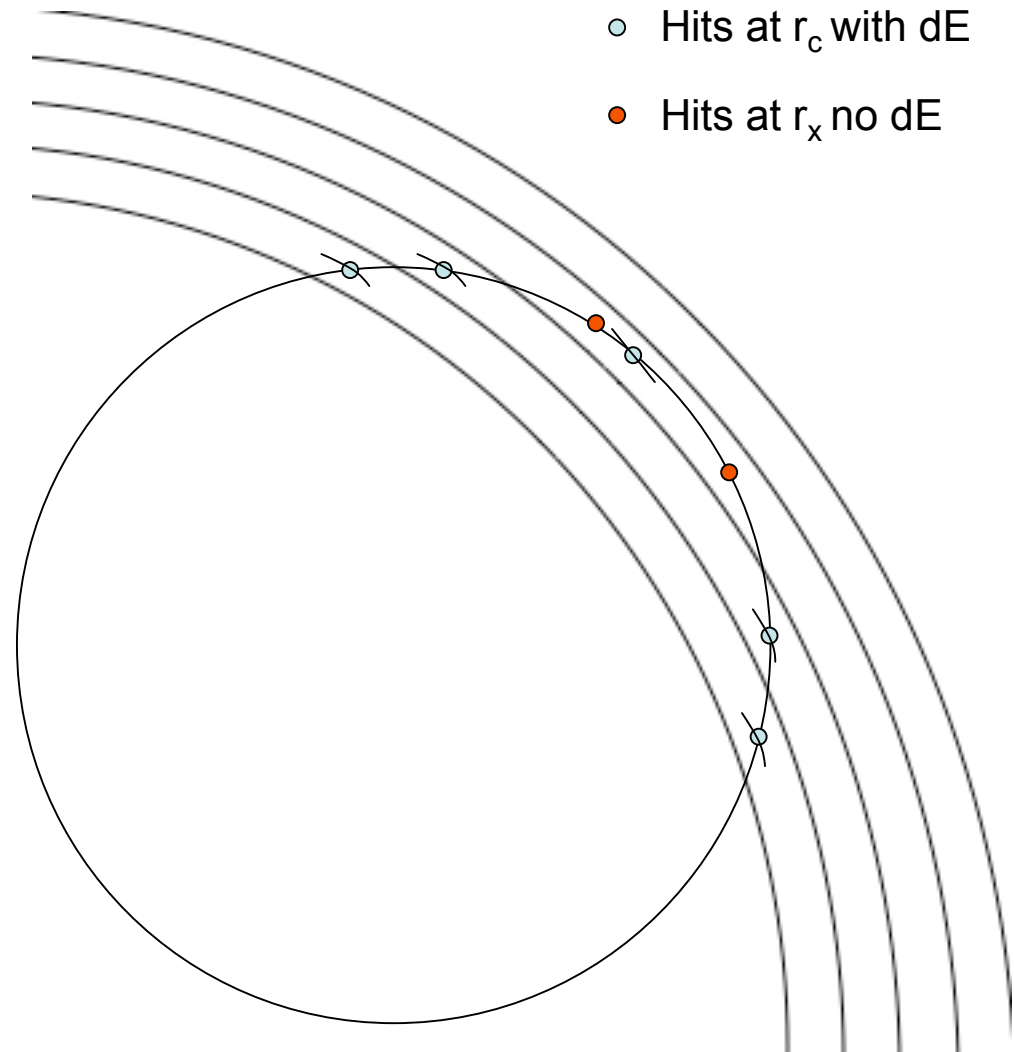


# A different approach

- Make sure hits from high Pt tracks do not suffer from artefacts
- Provide hits to aid reconstruction of Loopers
- Two separate types of hits, stored in two separate LCIO SimTrackerHit collections

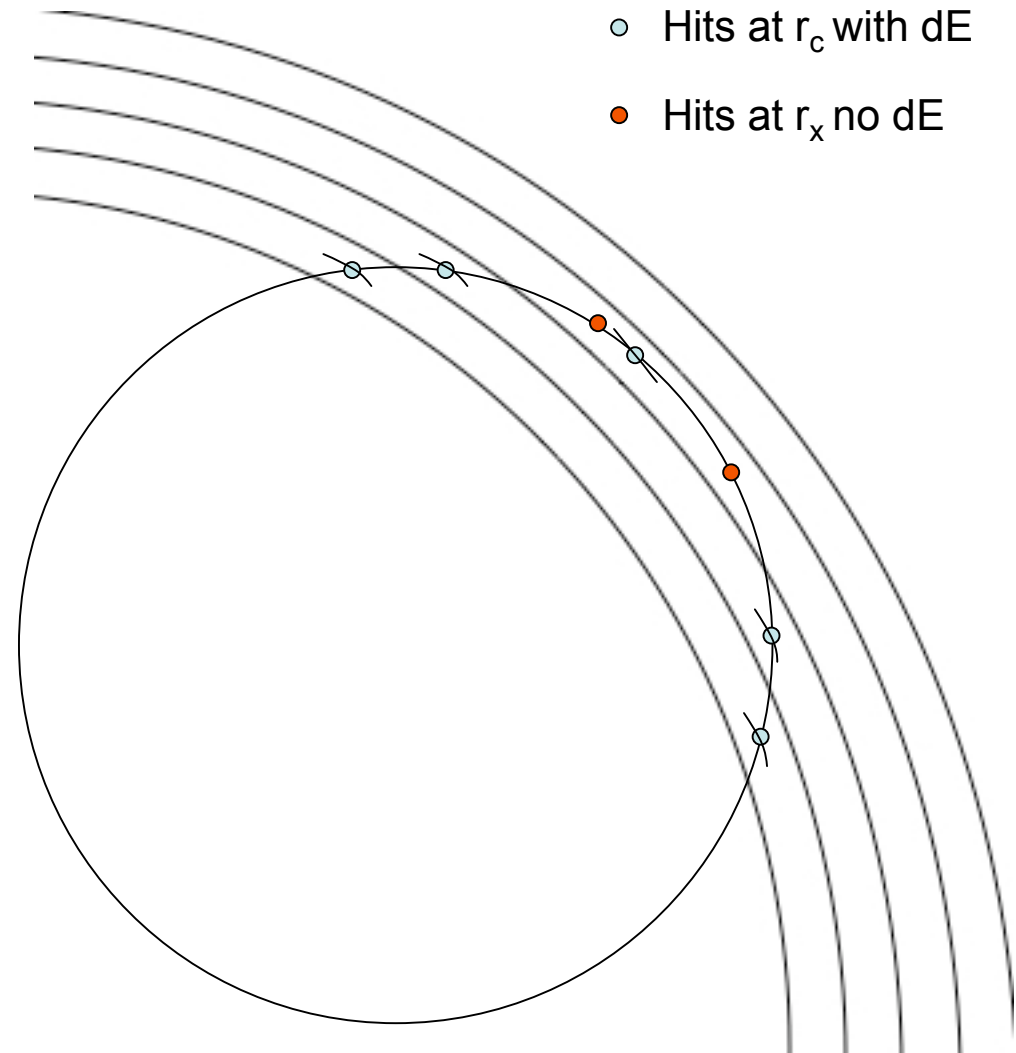
# A different approach

- Pad-rings are divided into two half pad-rings
- This creates a G4 logical volume boundary within the pad-ring at the central radius
- Any track crossing this boundary will have a step ending on it
- This point is used as the coordinate of the hit
- All other steps within this pad-ring have their dE added to this hit



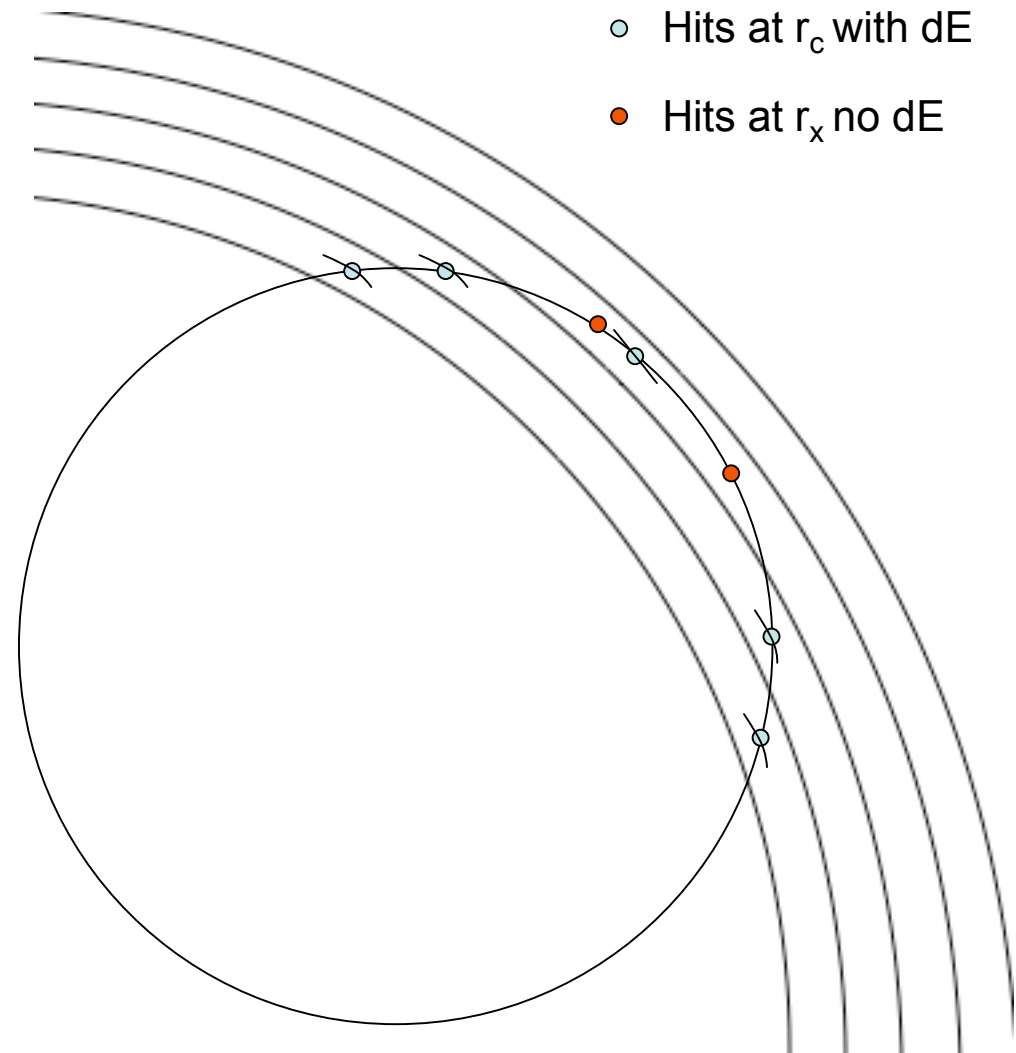
# A different approach

- User defined step length limit has been given a default value of 10mm (can be set at run time)
- Any time a step is stopped by this limit a hit is produced at the end of the step
- The dE is added to the hit at the centre of the pad-ring, and the dE of this hit is set to 0



# A different approach

- The blue hits represent those “measured” in the TPC  
These form the LCIO Collection  
TPCCollection
- The red hits are provided to enable a more accurate  
creation of hits for low Pt track  
These form the LCIO Collection  
TPCSpacePointCollection



# Present status

- Driver TPC06 and Sensitive Detector TPCSD02 are both in cvs and ready for full testing
- From these a new TPC model tpc08 will be implemented in LDC01-05Sc
- TPCDigiProcessor produces a single LCIO TrackHit Collection from the TPCCollection, i.e. the hits at the centre of the pads, using simple Gaussian smearing
- Tracking code tested by eye:
  - for single particle events, step by step debug shows no problems
  - 10 hZ->ee events processed, debug output show no major problems

# Present status

- Problems with large numbers of TPC hits
  - more than 60,000 observed in single event
- Need to implement the “Space-Point” hits in the digitiser
- Tracking needs to be reviewed

# Present status

