Karlsruher Institut für Technologie

First look at Cosmic CDC Tracks and Ideas for Estimating the Finding Efficiency

F2F Tracking Meeting

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ETP - KIT

Introduction

- Currently tracking validation is done in MC by comparing found tracks vs. tracks from MC truth
- First data from Global Cosmic Run 2017 is in. Can we use it?

GCR Data and MC

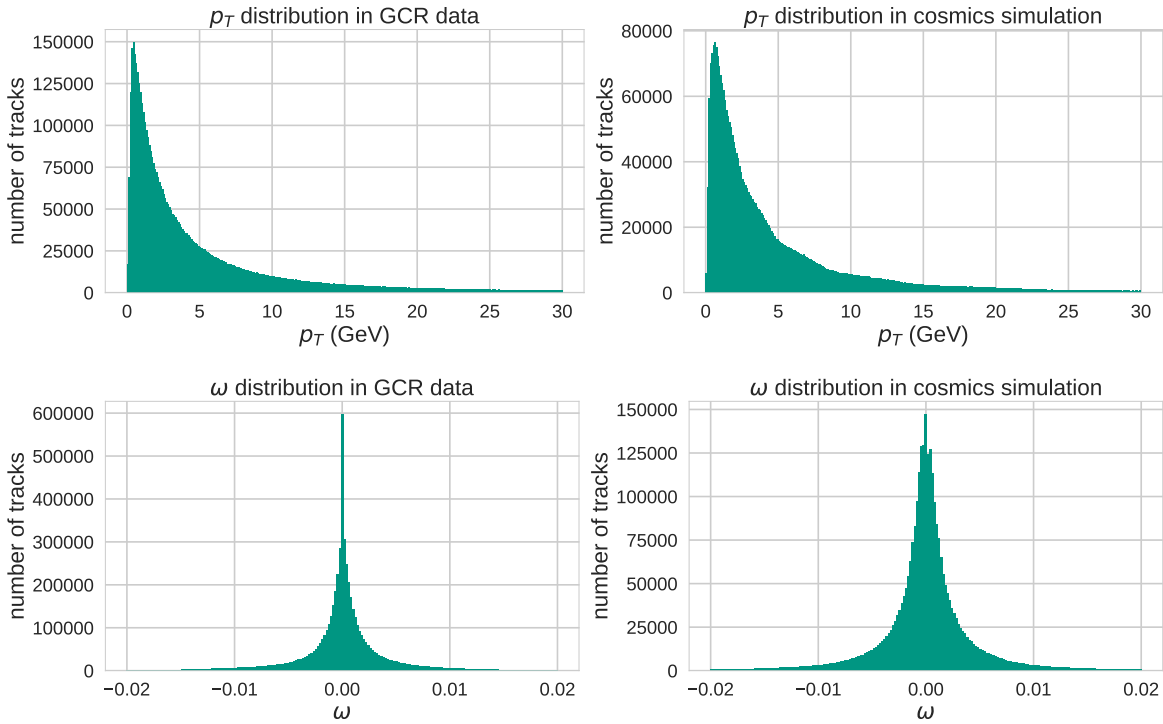
- use data from Global Cosmic Run (GCR) taken in July 2017
- use run numbers 3100–3370 (sugggested by Dong Thang) $\Rightarrow$ total 2.8 Million cosmic events with trigger selecting central tracks
- also produced 50 Million cosmic MC events with GCR setup
  - same as official MC group: large "accept box" of 8 m $\times$ 8 m $\times$ 8 m
  - no triggger in simulation, do kinematic cuts on central region (d_0, z_0) $\Rightarrow$ $\sim$10 times less statistics than in data remain

Links to information on data and MC production

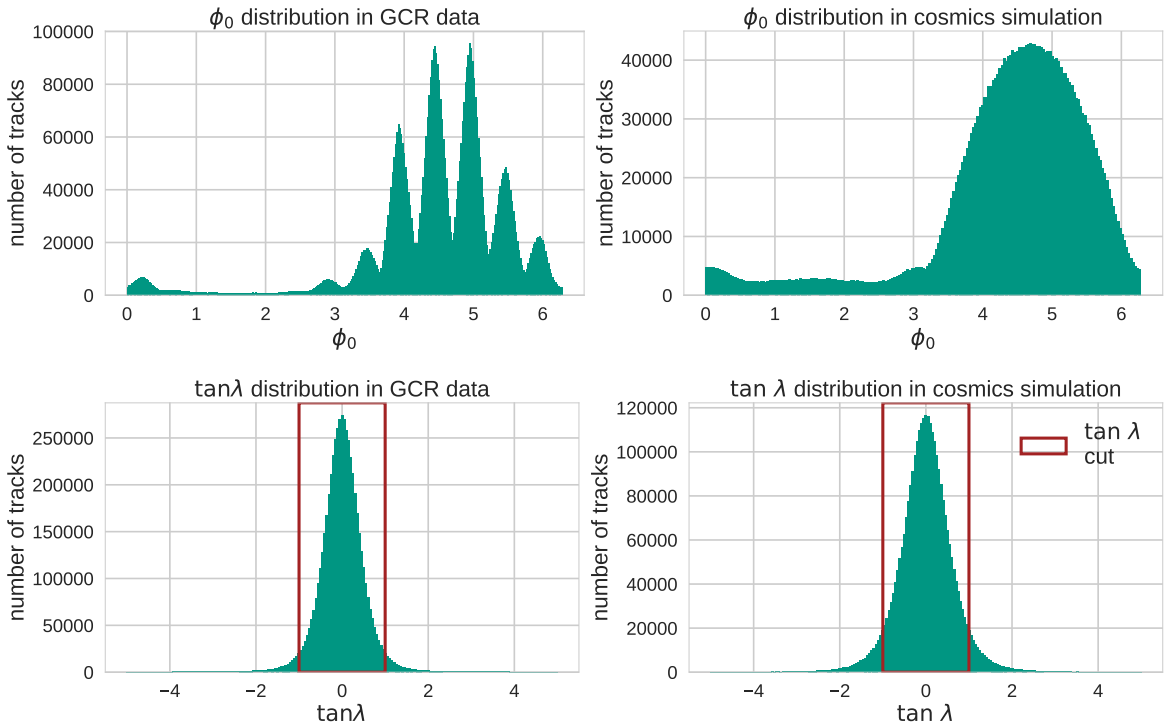
- Data: `https://confluence.desy.de/display/BI/Data+Production+Global+Cosmics+Run+Data#DataProductionGlobalCosmicsRunData-Runinfo`
- MC: `https://confluence.desy.de/display/BI/Data+Production+Global+Cosmics+Run+MC`

Look at Kinematic Distributions: Data with trigger and MC

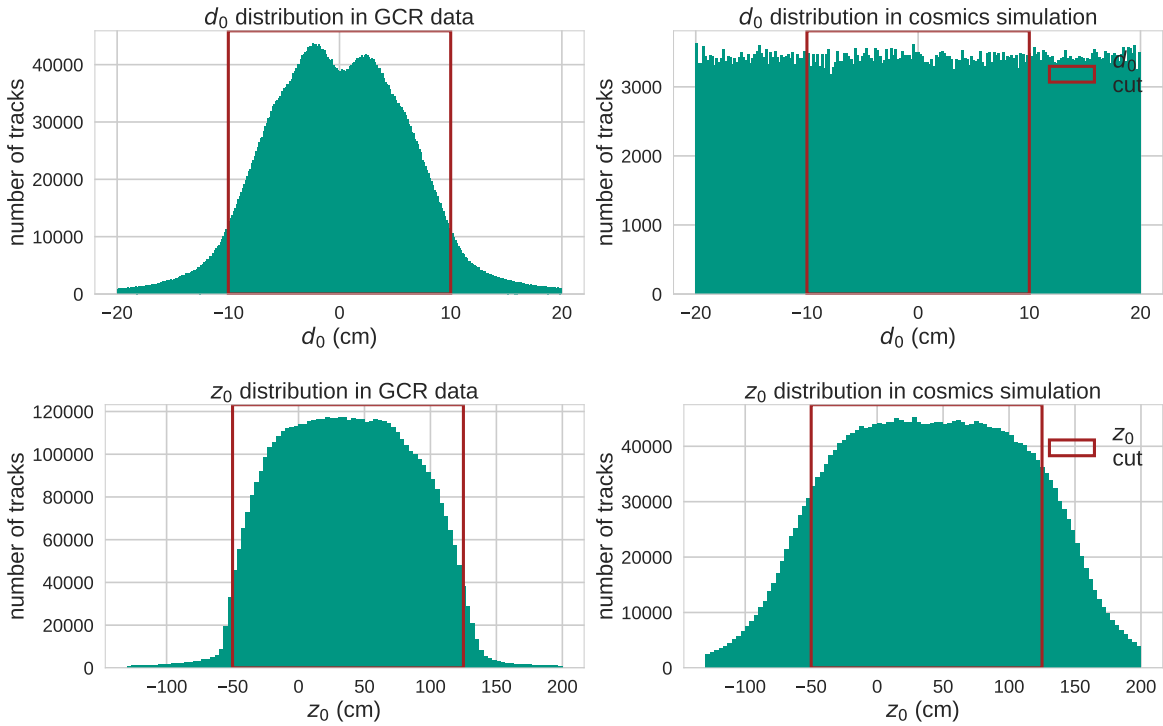
- left data (includes triggerr), right MC (without trigger)
- use (preliminary) cuts for selection of central tracks (red lines)
- B-Field mapper not in simulation



- p_T distributions seem similar, but more events with $\omega = 0$



- effects of B-field mapper visible in phi_0 distribution



- distribution in MC due to lack of trigger much wider, use cuts on central region

Idea: Cosmics-Data based Estimation of Finding Efficiency

- tracks passing through the centre (where SVD will be) are split
- usually reconstructed as two `NonMergedRecoTracks`, which are then merged to `RecoTracks`
- get estimate of finding efficiency from events where two tracks expected, but only one found (finding fails)
- idea: compare results with MC based finding efficieny from `TrackMatchLookUp`

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$$\text{Finding efficiency} = \frac{N_{2\text{ tracks found}}}{N_{2\text{ tracks expected}}} = 1 - \frac{N_{1\text{ track found}}}{N_{2\text{ tracks expected}}}$$

where $N_{1\text{ track found}}, N_{2\text{ tracks found}}, \in N_{2\text{ tracks expected}}$, so that $N_{1\text{ track found}} + N_{2\text{ tracks found}} = N_{2\text{ tracks expected}}$.

Selection of expected two-track events in MC and data

- TODO

“Background”: Events where only one track is expected

WIP: Select

Testing the Method with Preliminary Cuts (not from MC)