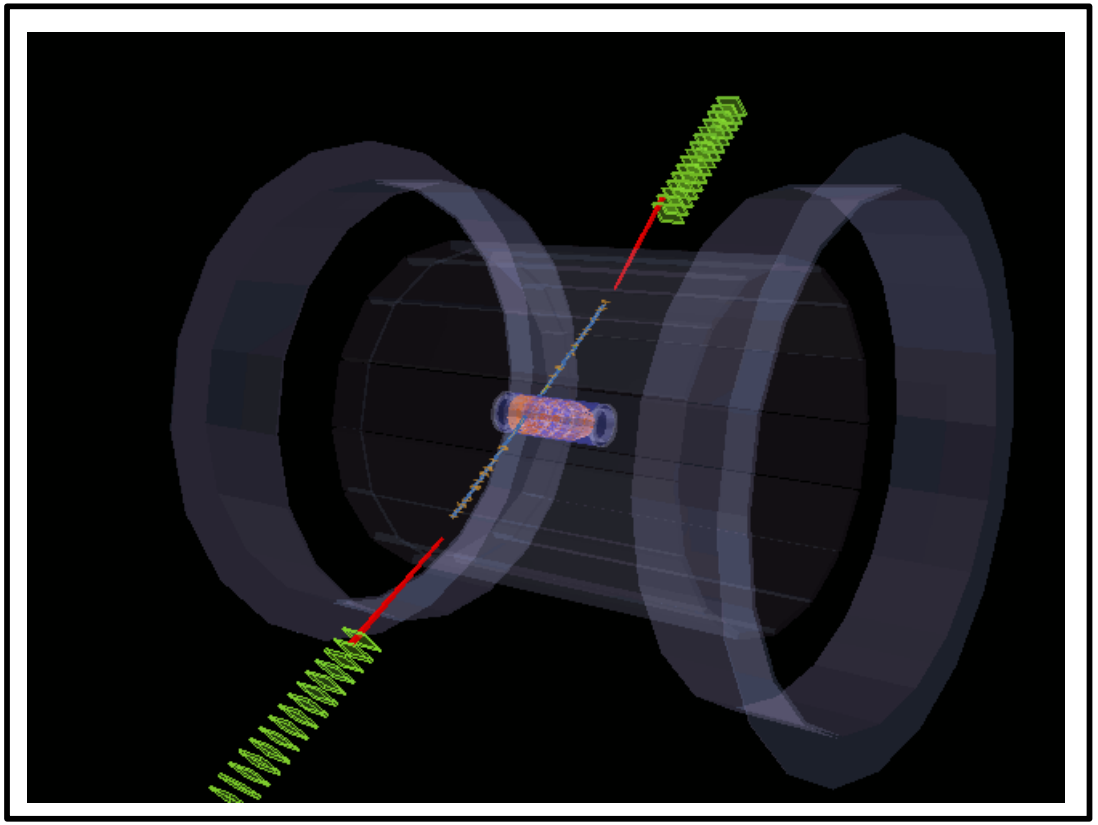
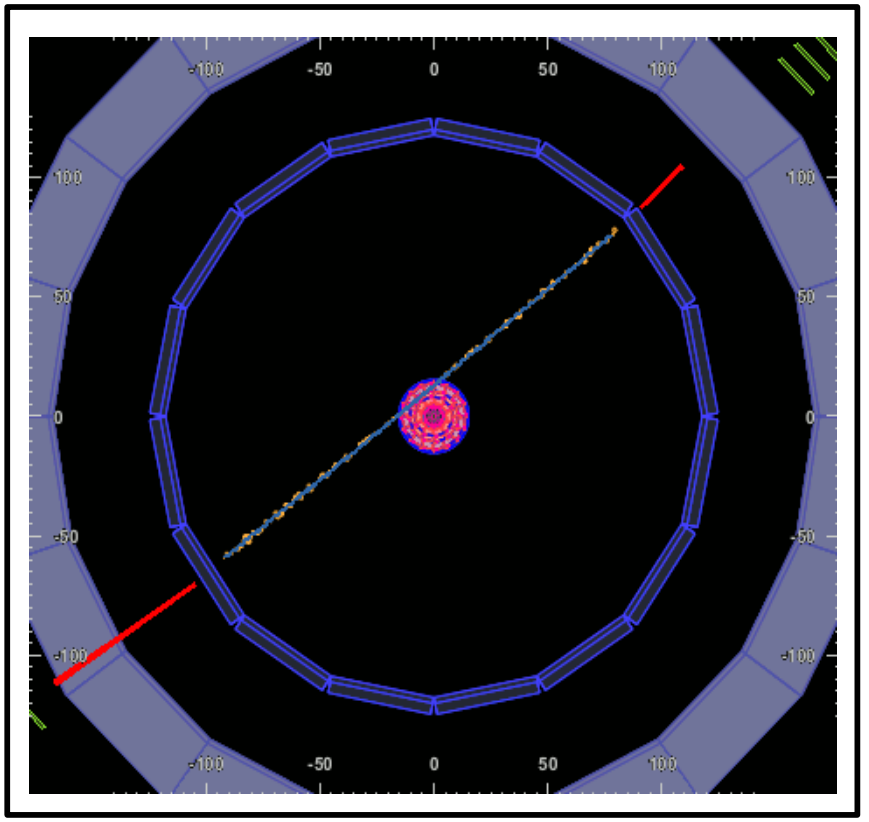
Performances with cosmics and single track
(with magnetic field)

K.Trabelsi (KEK)
2017/07/11



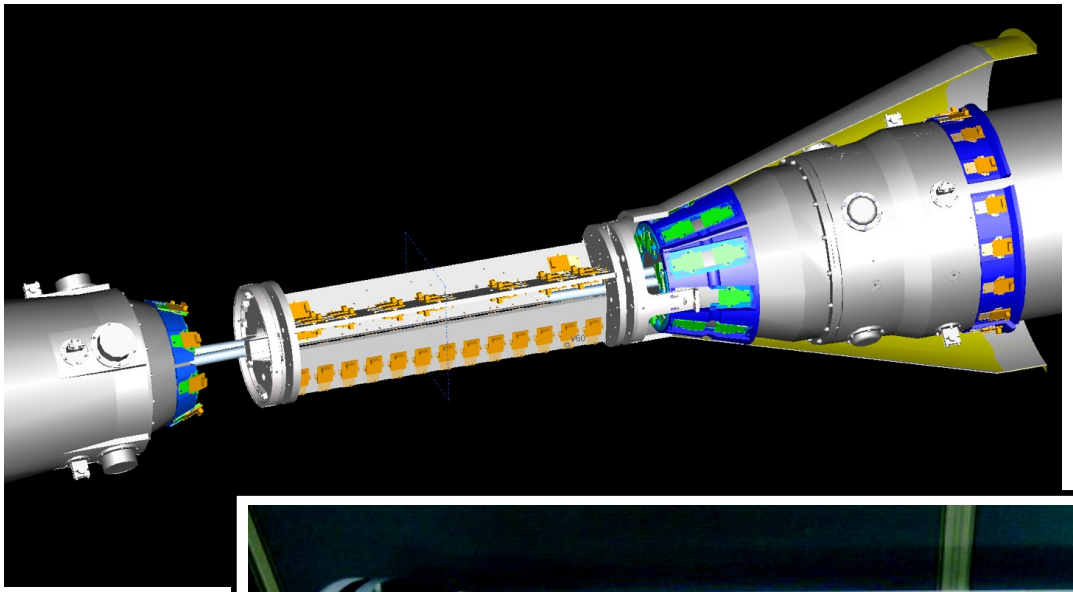


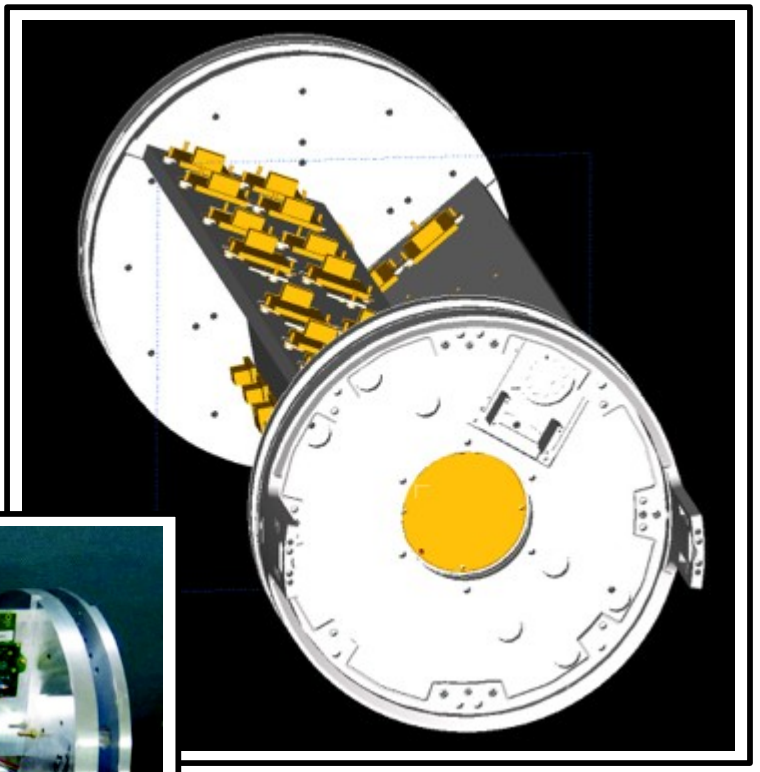
cosmics conditions

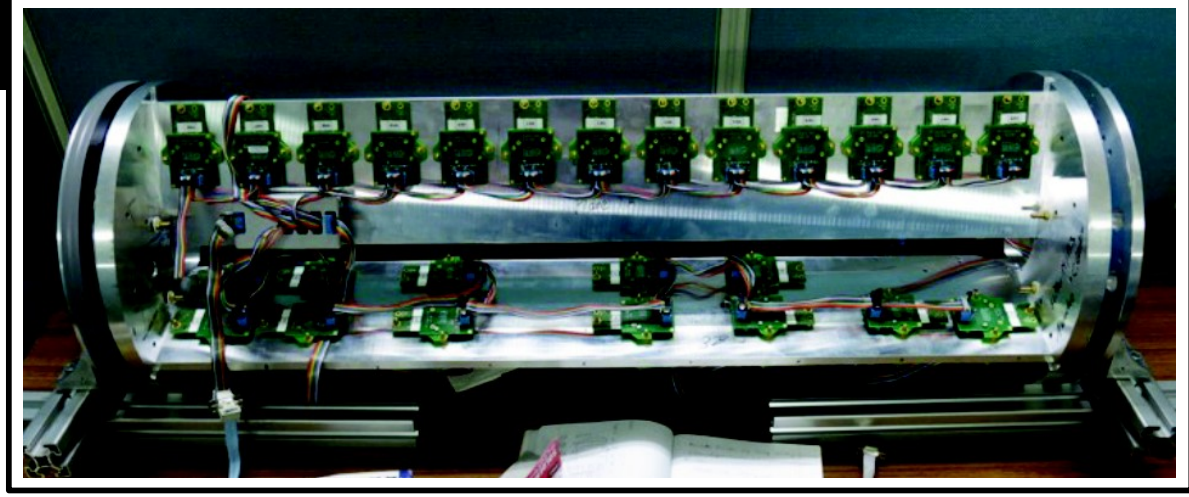
https://confluence.desy.de/display/BI/Data+Production+Global+Cosmics+Run+MC

- GCR June-August 2017
- first runs with magnetic field (on from May 26)
- detectors available: CDC + TOP + ECL + KLM
- no scintillator, B-field mapper (share shifts)
- **geometry/data/GCR_Summer2017.xml** → Yinghui Guan

  → for now B-field mapper not included, just a beam pipe for now







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- samples generated in two steps
- https://stash.desy.de/projects/**B2P**/repos/mc/browse/GCR1/... /Sim and /Rec
- ouputs: raw data and dst/mdst++
- mdst++: mdst + ECLDigits + ECLCalDigits + RecoTracks + CDCDedxTracks
- sample of interest:
  - 50M evts requesting that tracks go through IP region

/ghi/fs01/belle2/bdata/users/karim/MC_data/Cosmics/

accept/keepLength = 0.6 (m)
accept/keepWidth = 0.2 (m)
accept/keepHeight = 0.2 (m)

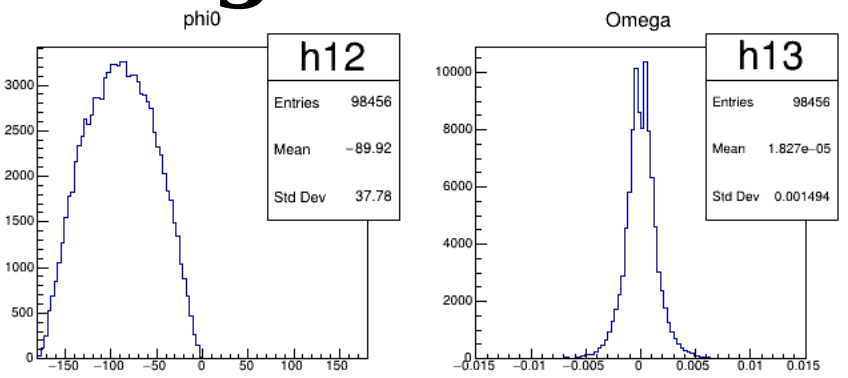
with prerelease-00-09b

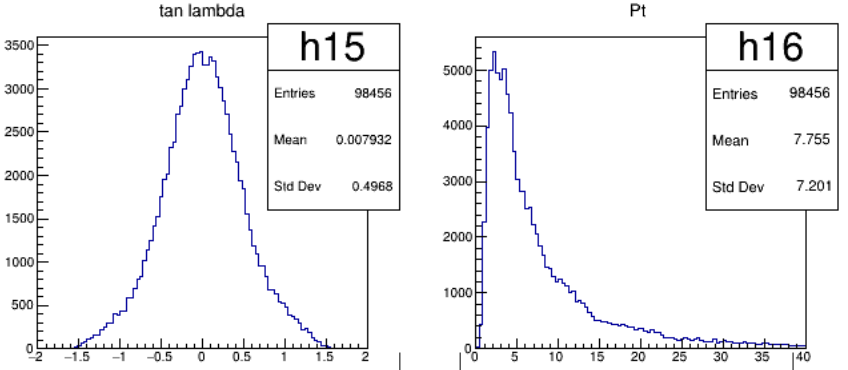
⇒ 50M events

⇒ with merge_tracks = false (reconstruct in two tracks)

Single muon vs Cosmics

Cosmics sample



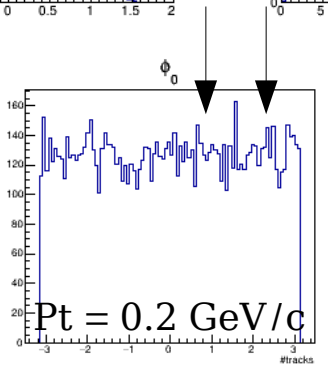


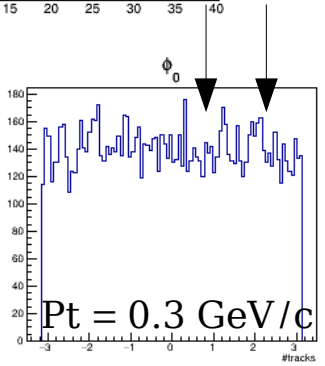
Single muon sample

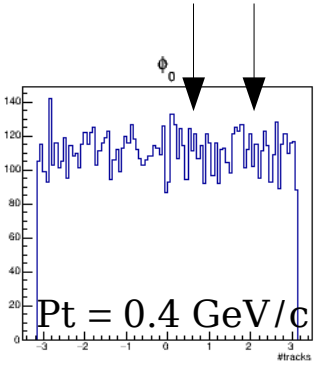
regenerate sample

$\theta = [55, 125]$ deg

$\phi = [50, 130]$ deg







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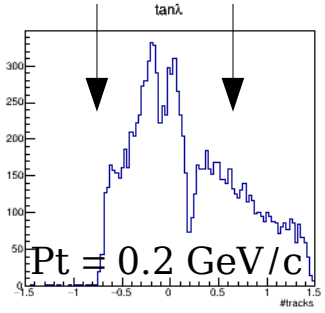
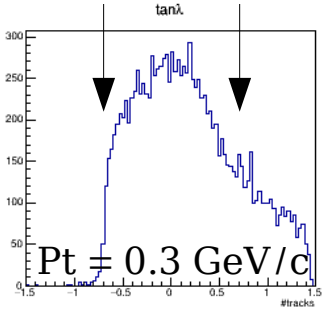
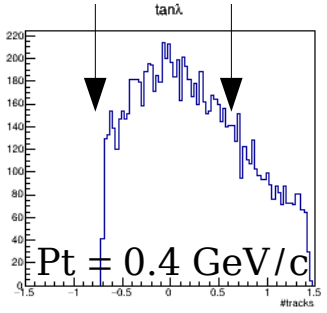


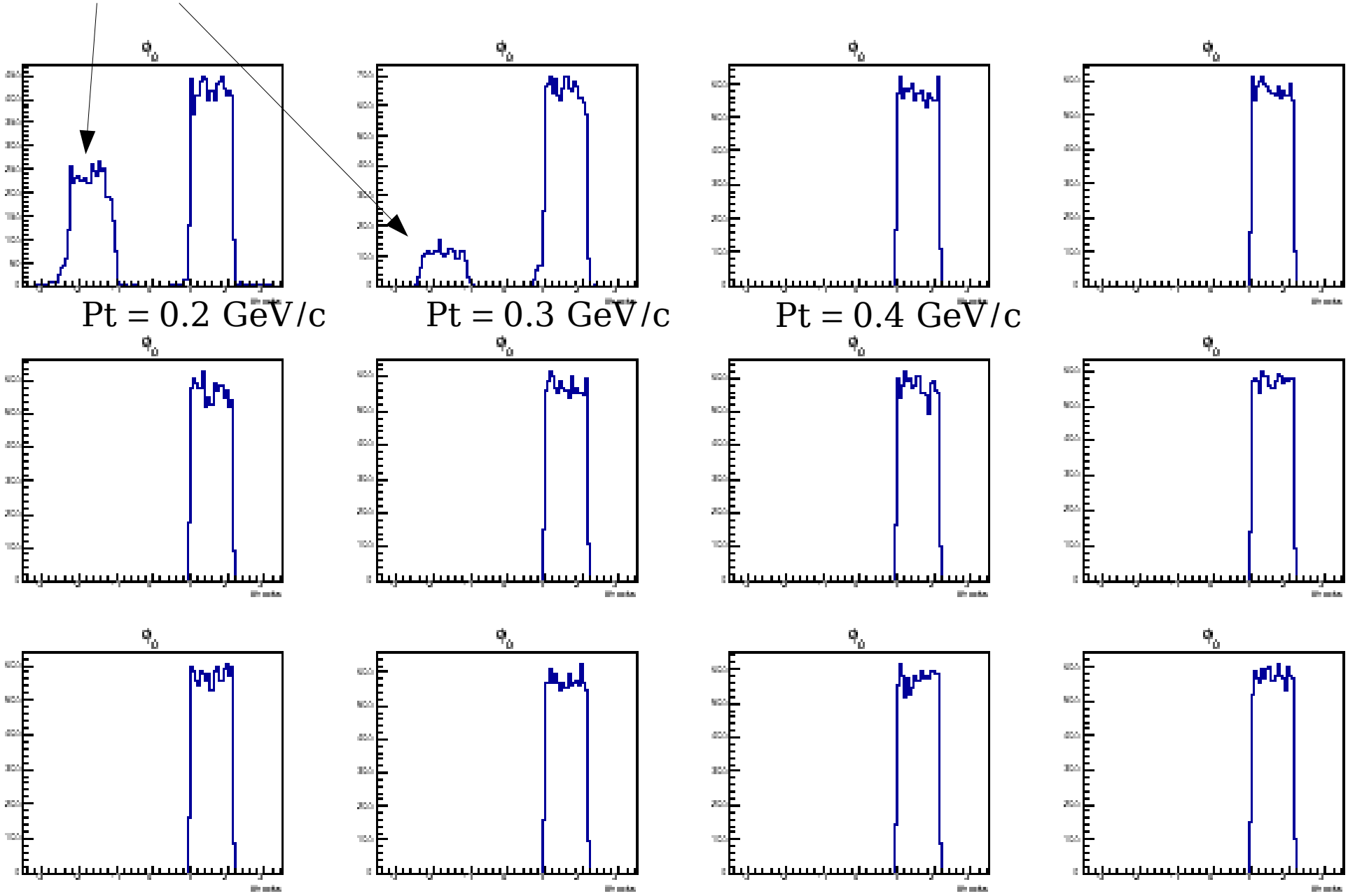




…

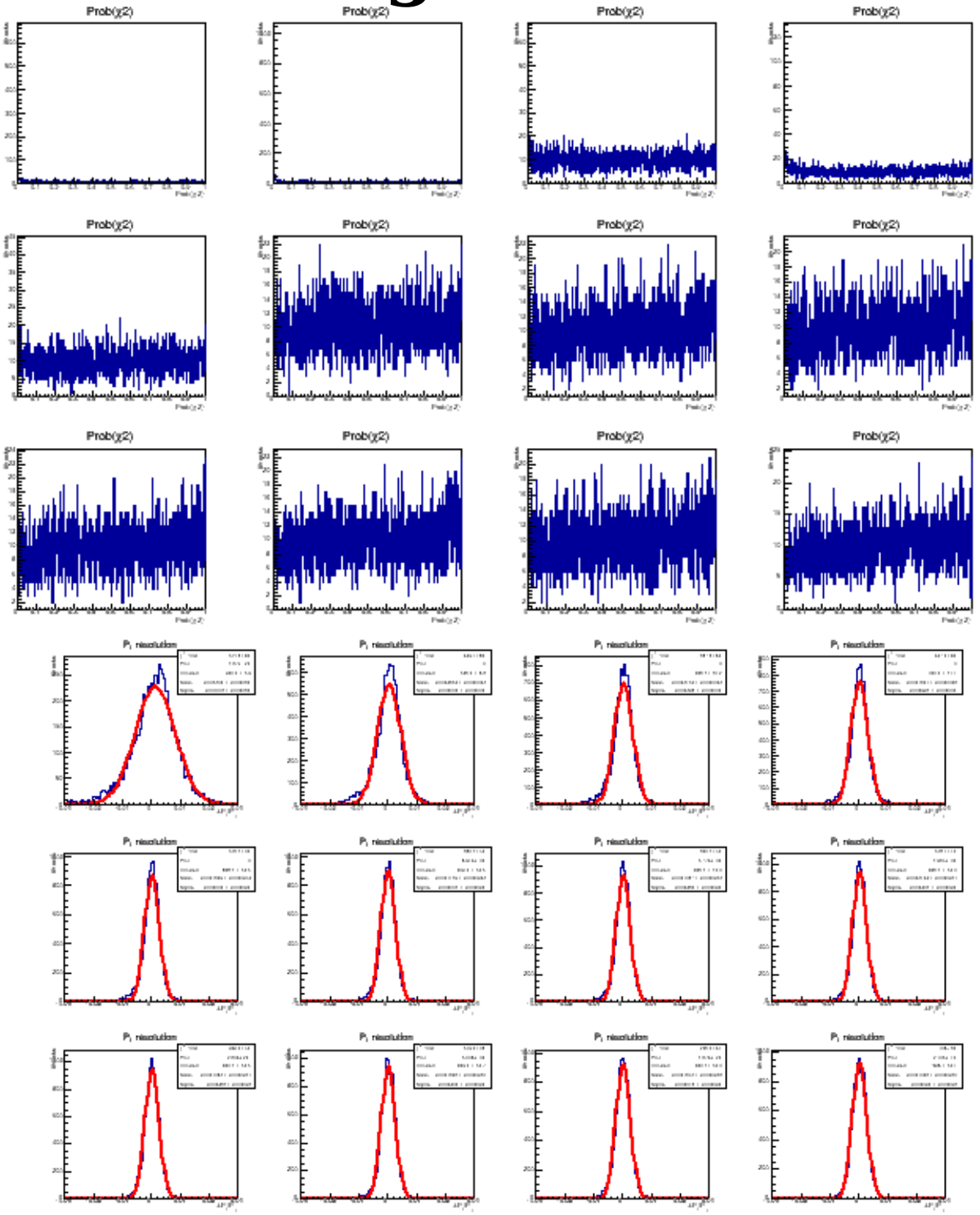
Single muon

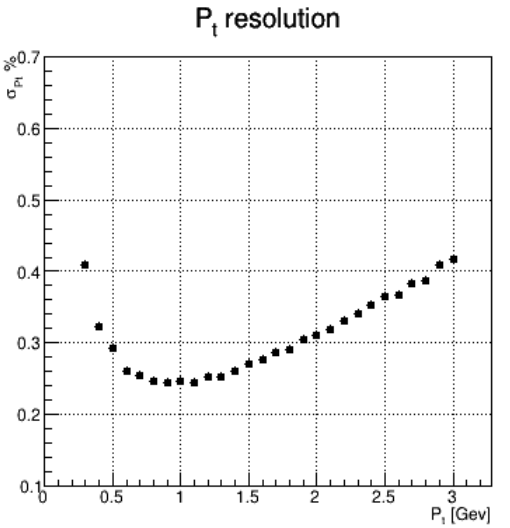
other branch of curling track

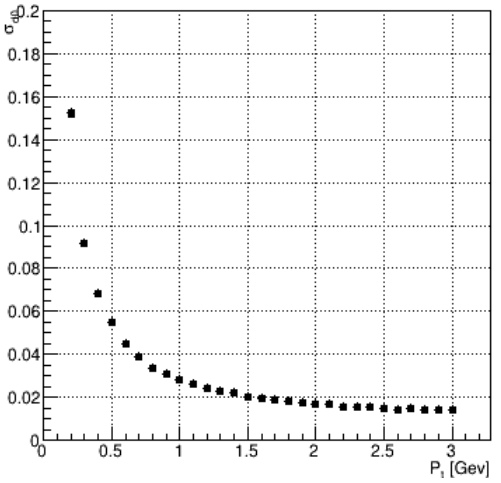


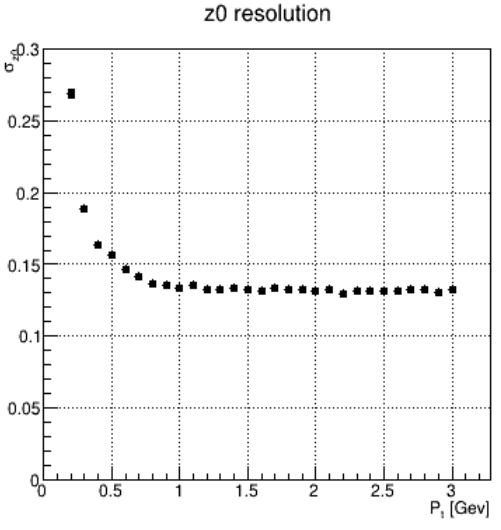
Pt = 0.2 GeV/c Pt = 0.3 GeV/c Pt = 0.4 GeV/c

Single muon


Prob(χ2)
Pt resolution

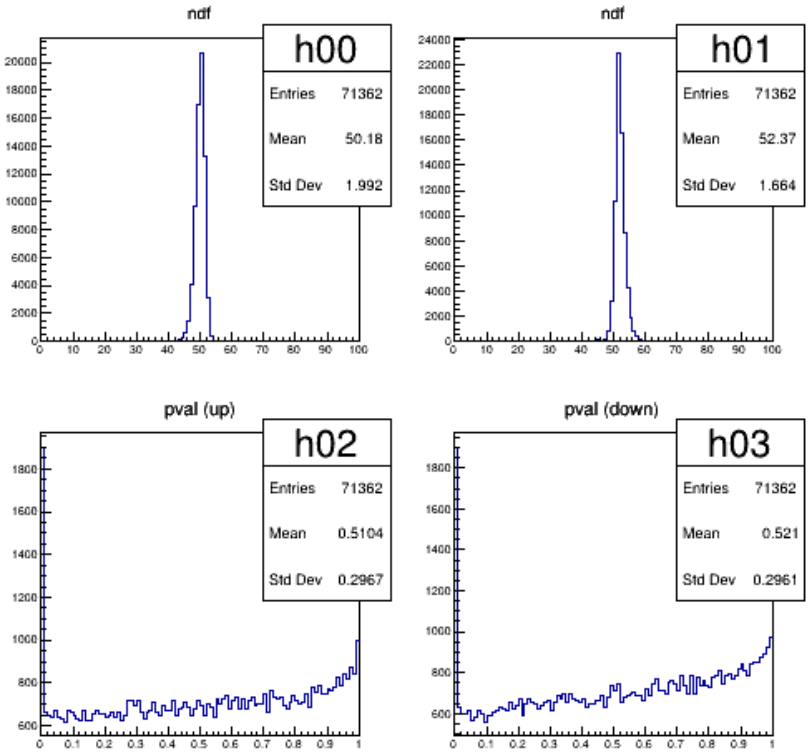

Pt resolution
σPt %
Pt [Gev]

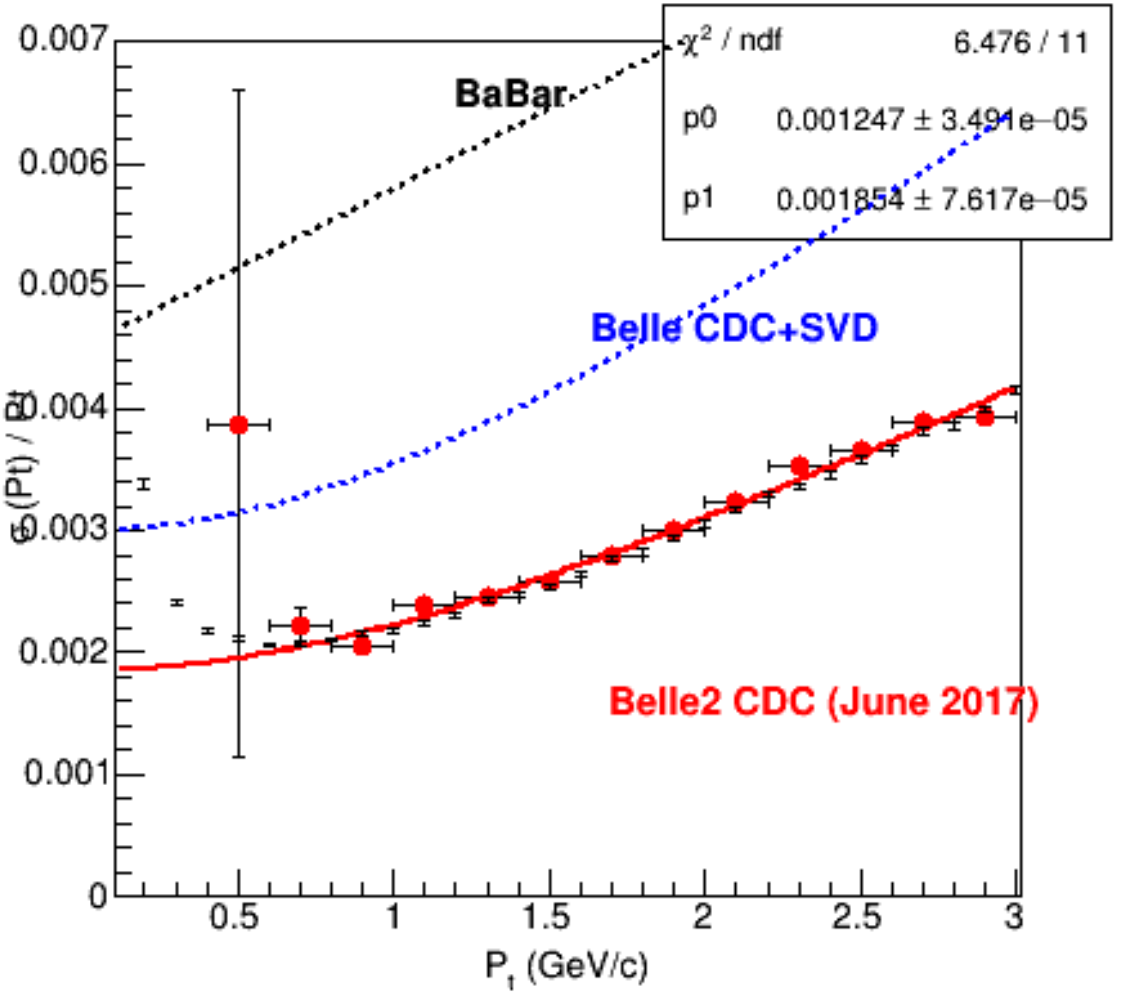

d0 resolution
σd0
Pt [Gev]


z0 resolution
σz0
Pt [Gev]

Cosmics

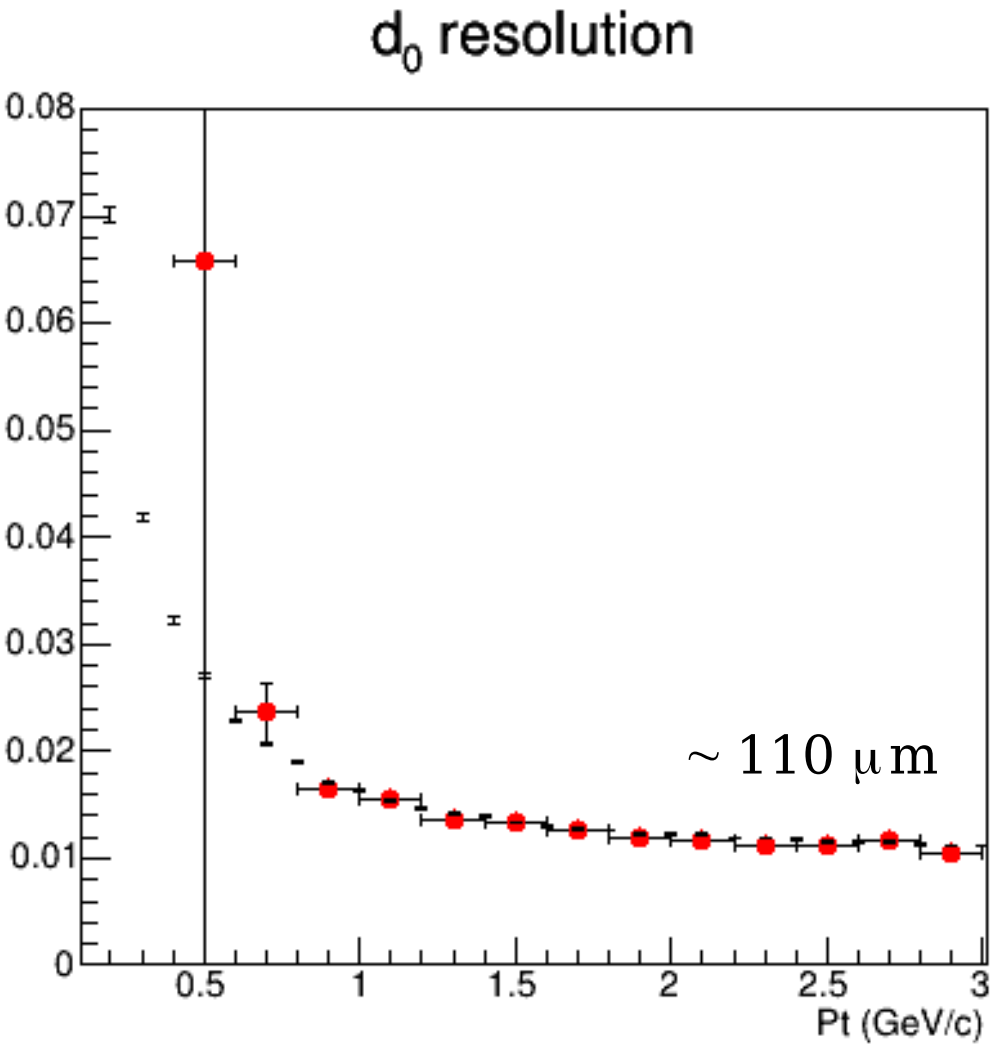
select two-tracks events with ndf > 25 and
$|d_0| < 1$ cm, $|z_0| < 3$ cm, $|\tan\lambda| < 0.5$, $|\phi_0 - 90| < 40$ deg

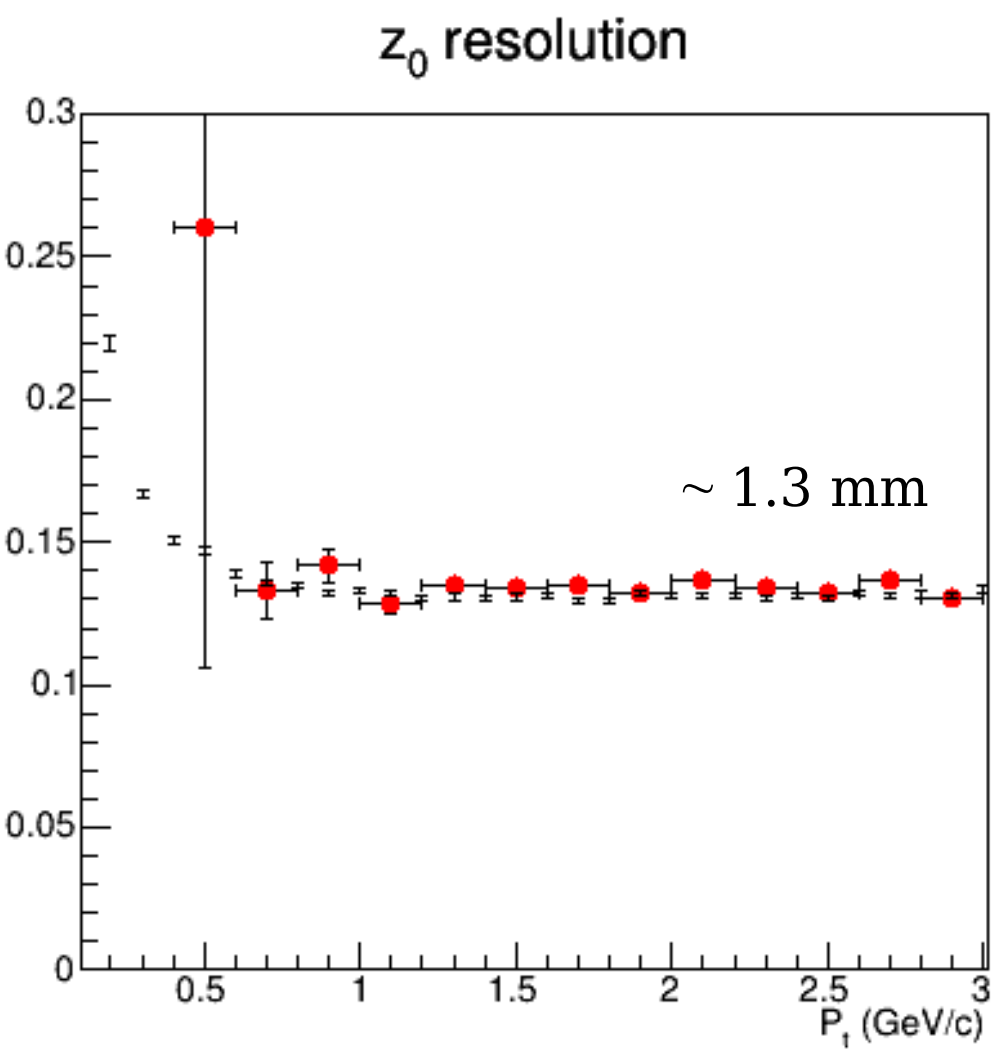




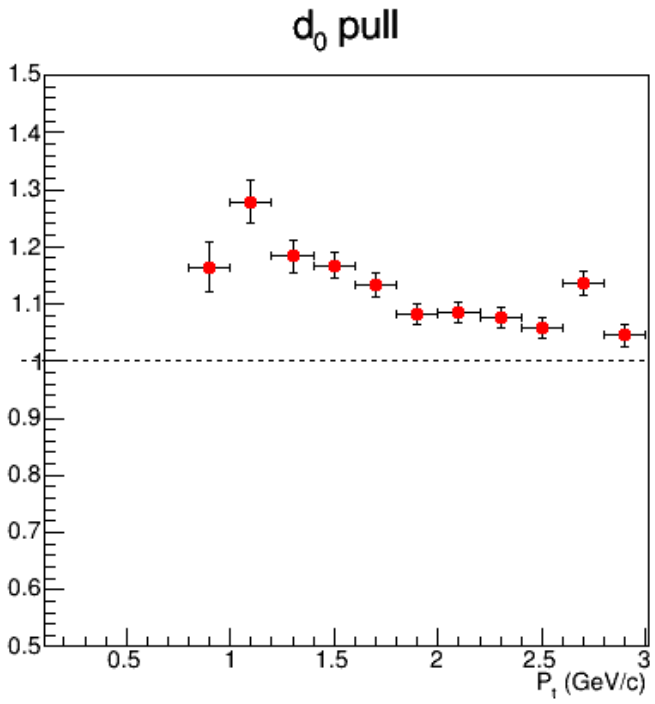
- p-value not perfect, uncertainties over-estimated ?
- not much information for $P_t < 0.5$ GeV

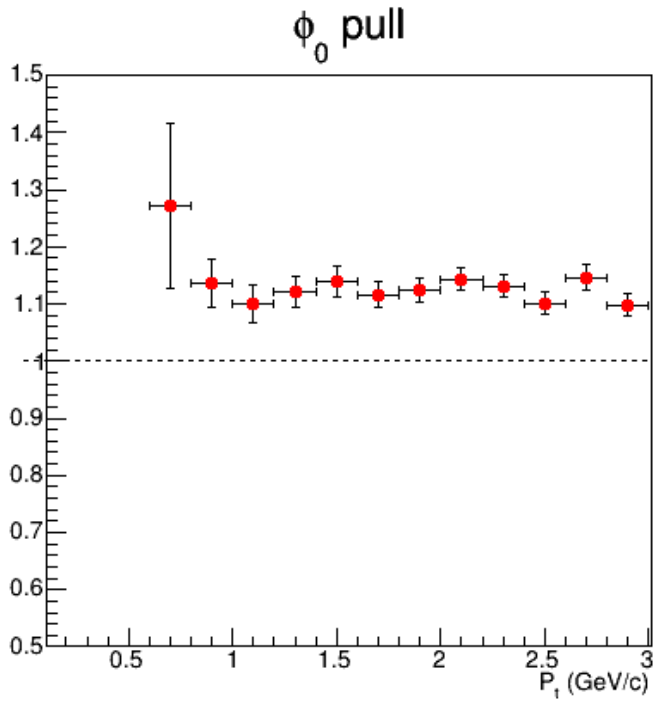
Cosmics: impact parameters d_0 and z_0

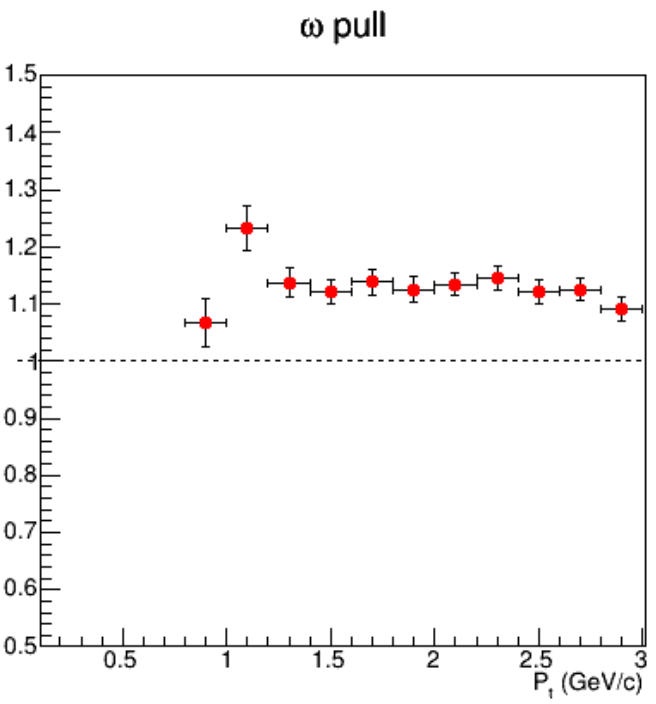


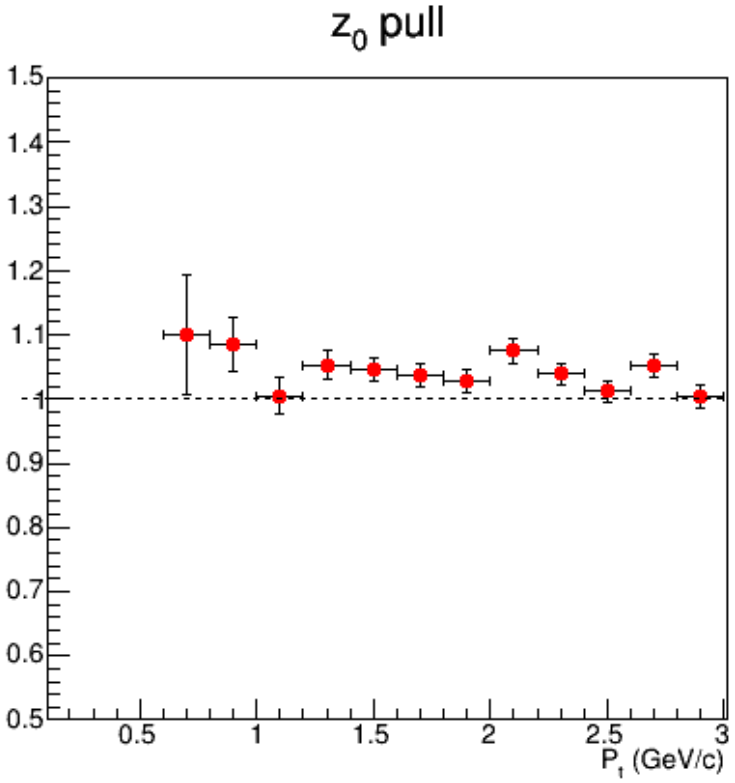


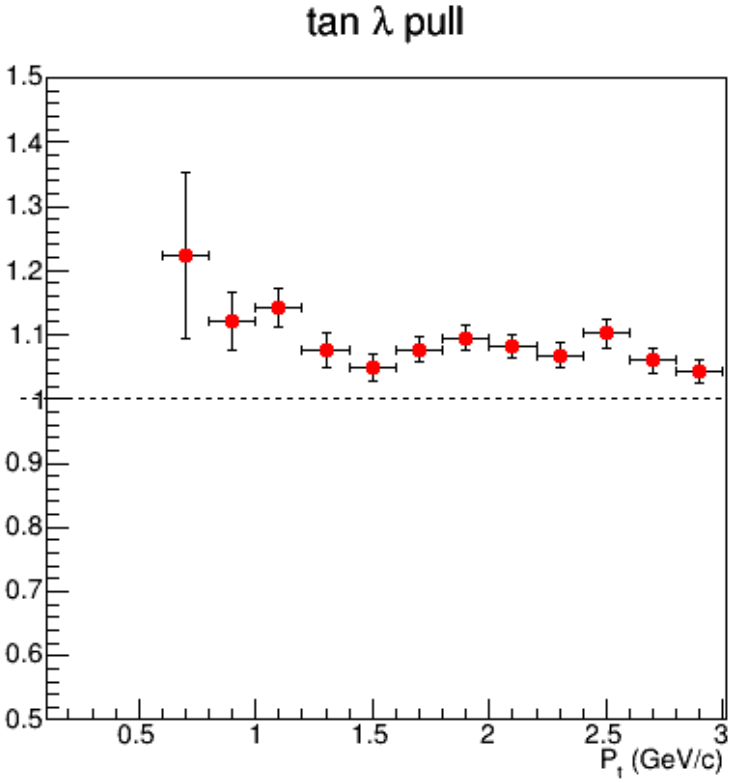
- fine for z_0 and d_0
- validating the procedure to estimate CDC performances


d_0 pull
P_t (GeV/c)


ϕ_0 pull
P_t (GeV/c)

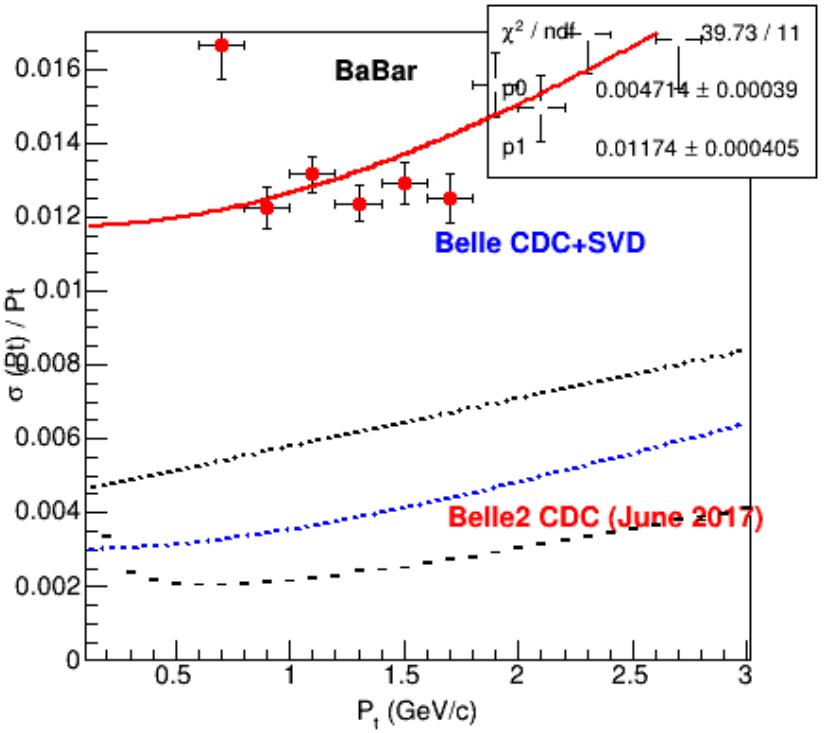

ω pull
P_t (GeV/c)

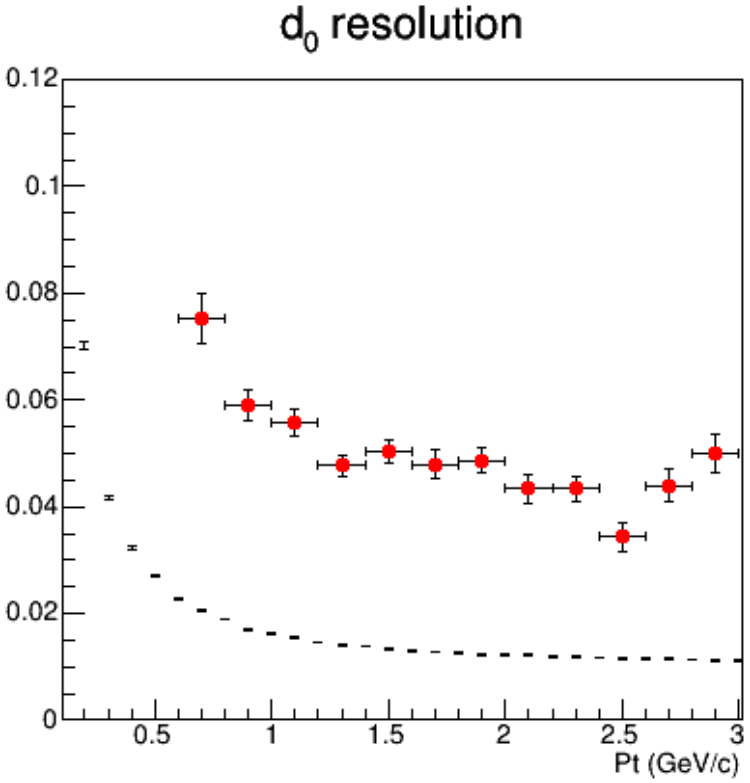

z_0 pull
P_t (GeV/c)

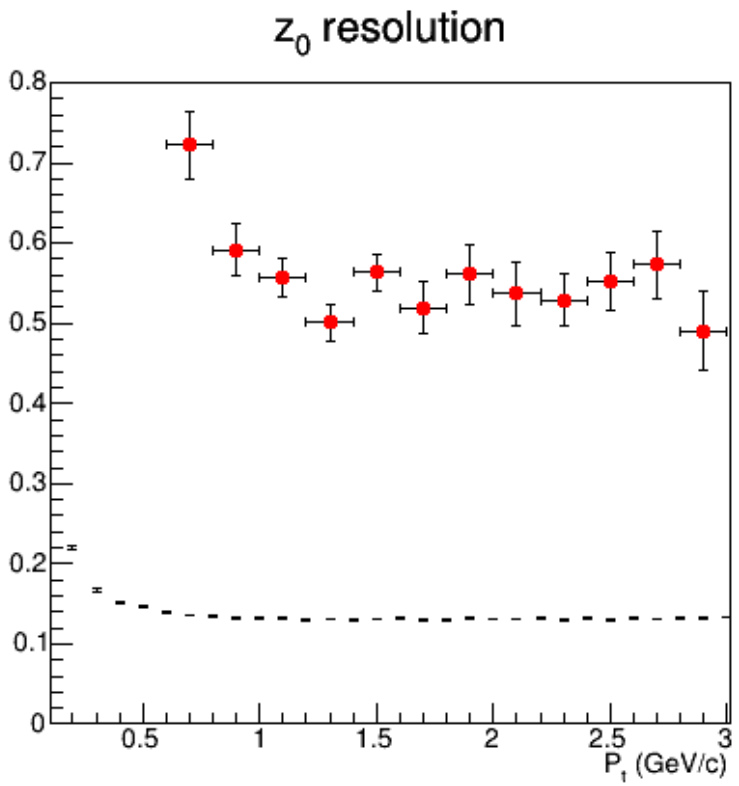

tan λ pull
P_t (GeV/c)

Situation of data cosmics

- Using release-00-09-00, central DB
- runs 3173, 3170, 3169, 3168, 3165, 3120, 3119, 3118
- data taken 2017-07-(06/05/04)
- ~ 800k evts

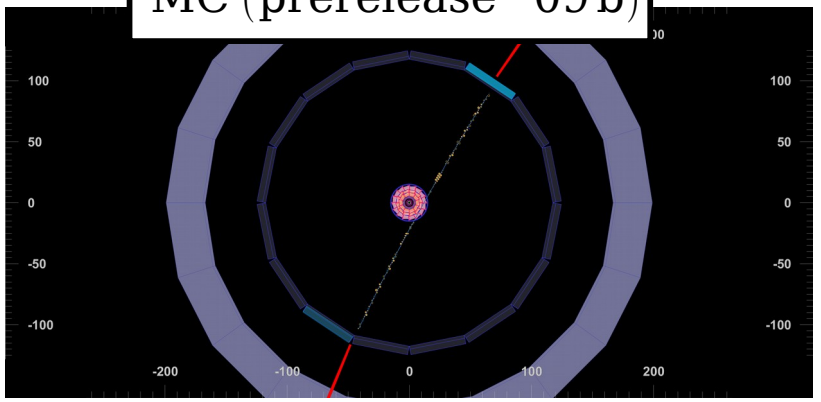


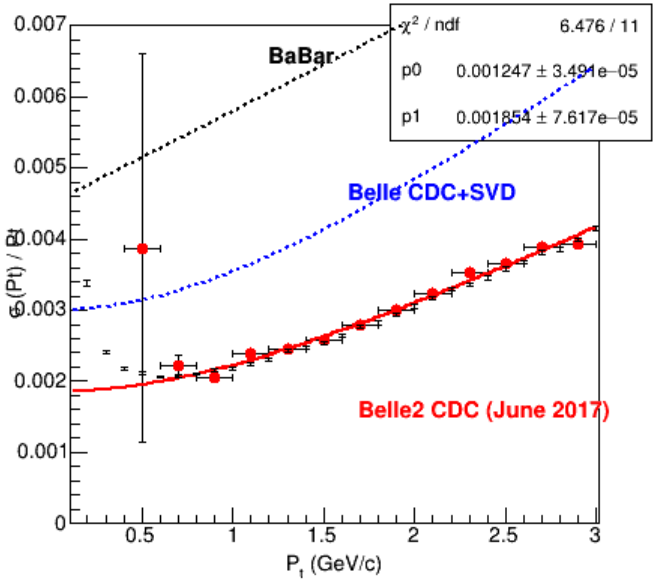


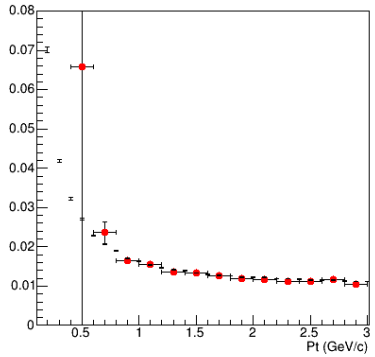


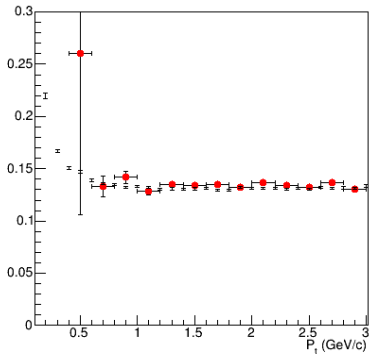
CDC performances with magnetic field

MC (prerelease−09b)

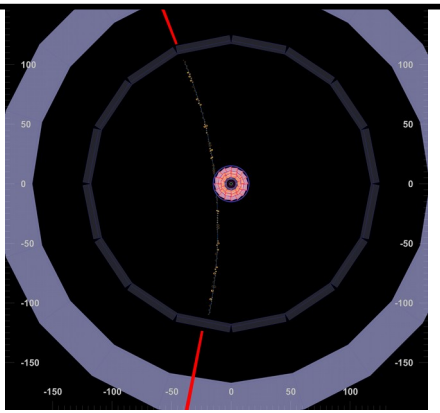


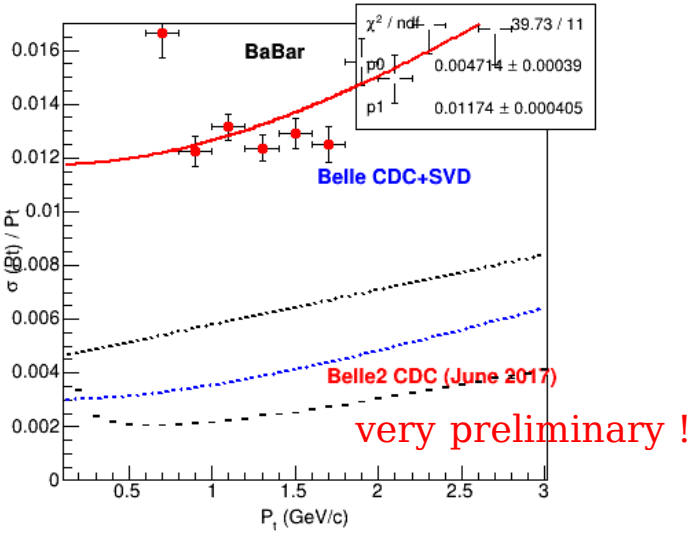


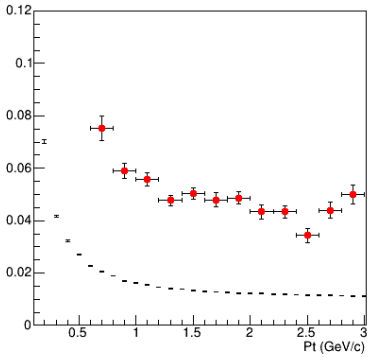


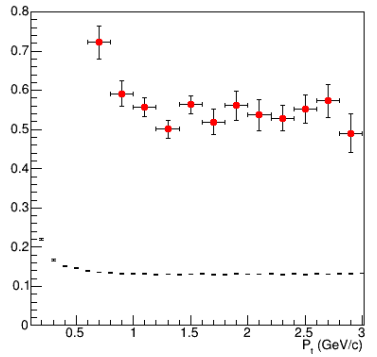


GCR data, July 2017









Summary

- No major issue found with prerelease-00-09b (MC)
- Performances using cosmics MC simulation are satisfactory
  issue with d_0 comparison with single muon is solved (geometry not properly initialized)
- First GCR1 data reprocessed (~ 800k evts)
  ⇒ performances still quite poor, probably DB constants not sufficient
  ⇒ need to establish clear procedure to update constants for DB
  (including corresponding validation) → M. Uchida's talk

  ⇒ Ekin will join our efforts to monitor GCR1 MC/data