Study of run-dependent collision point parameters

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S. Glazov, Weekly tracking meeting, 25 May 2018.

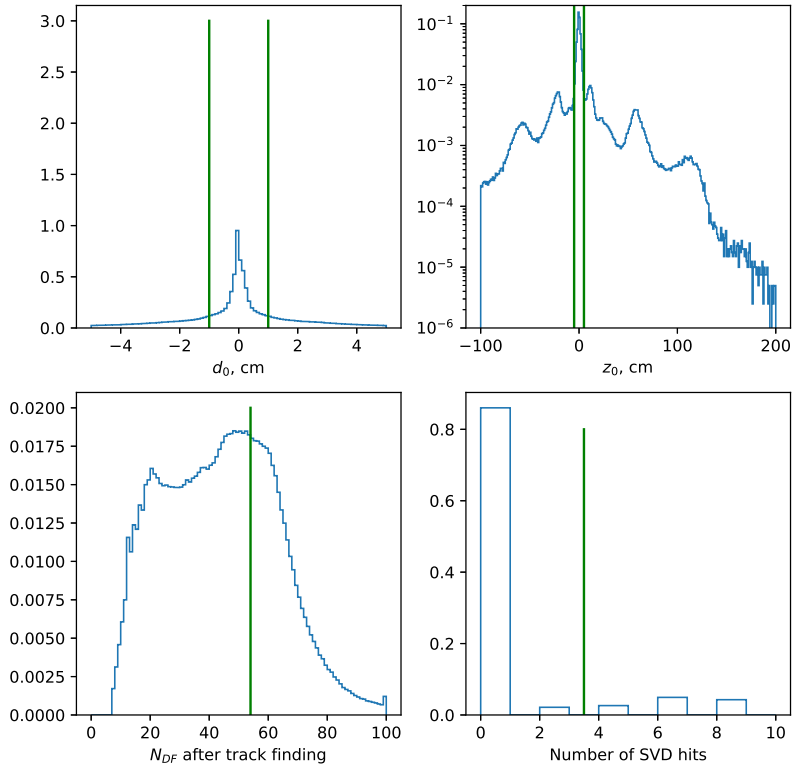
Motivation

- Main goal of the phase-II parameters is to establish "nano-beam" scheme of the collisions, with acceptable background for the detector.
- Tracking can provide fast feedback to tune accelerator parameters.
- Simple selection criteria are preferred to be sensitive to both collision and background events $\rightarrow$ track based selection.
- Good resolution can be achieved with SVD only, requires preliminary alignment.
- d_0 distribution is useful, however resolution is too crude vs nano-beam spot size
- $\rightarrow$ focus on z_0 distribution, which is proposed to be shown publicly

Tracking ntuples

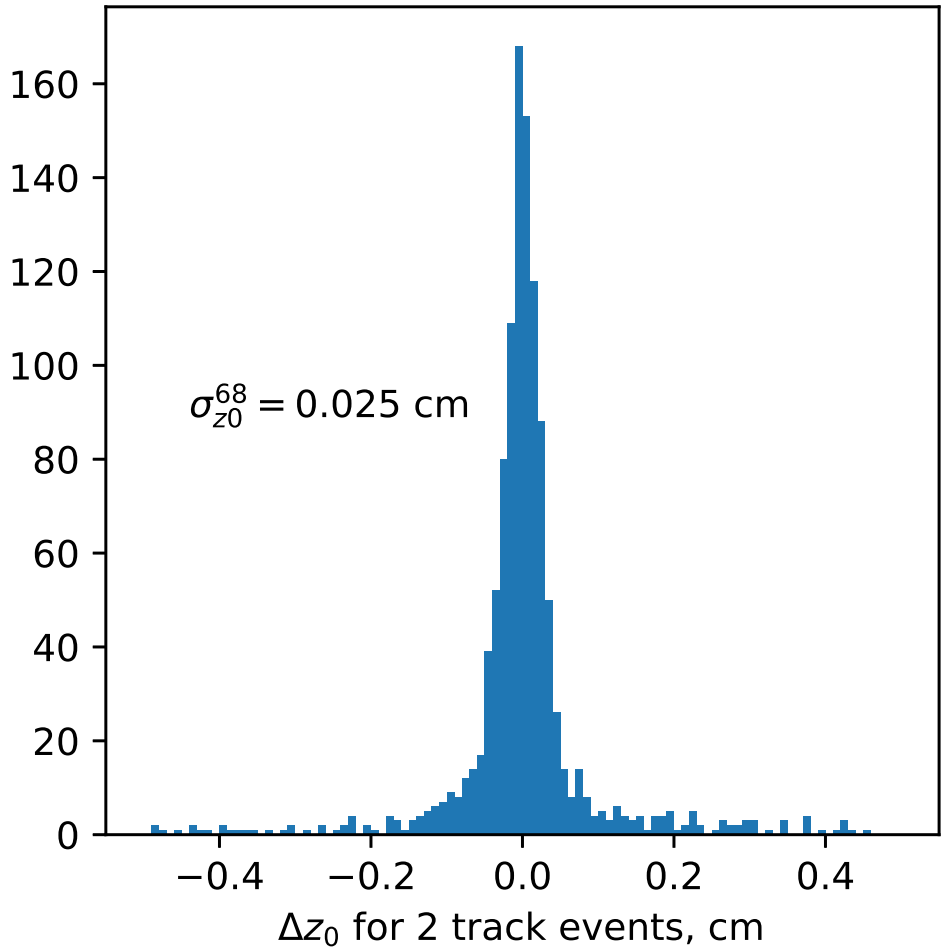
- Produced by Nils, variables selected by Felix, using codes developed by Oliver.
- Details for the production can be found in Nils' talk
- Basic properties:
  - Two types of trees produced: track-based and hits based
  - Production is based on the latest reprocessing at the time (prod2: release-01-02-03/GT382).
  - Additional private tags are used, three versions of ntuples are generated: with/without preliminary SVD alignment, with/without updated B-Field map.

Track selection



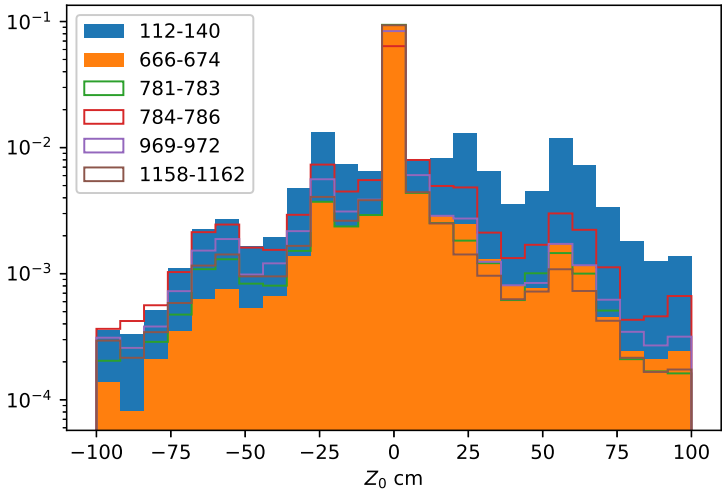
Require $|Z_0| < 5$ cm, $d_0 < 1$ cm to select tracks from the interaction region, Select $N_{\mathrm{DF\ TF}} > 54$ and $N_{\mathrm{SVD}} > 2$ for well-reconstructed tracks.

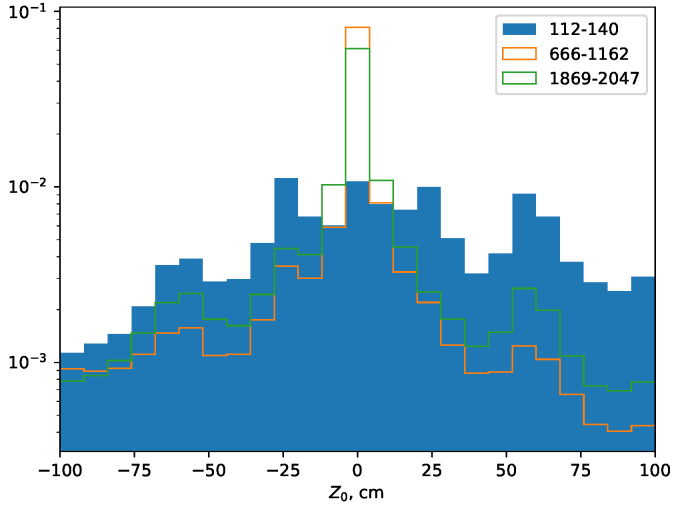
Z_0 resolution



Determine expected resolution of z_0 using two-track events. Divide σ_{68} by $\sqrt{2}$ to get expected per-track resolution of 0.4 mm.

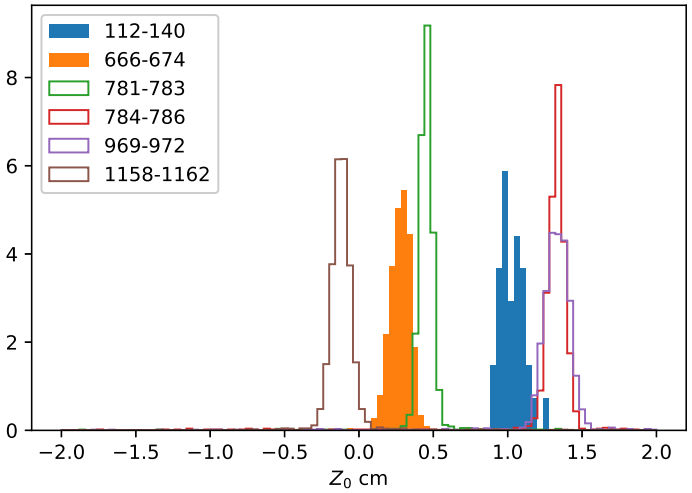
Z_0 run dependence

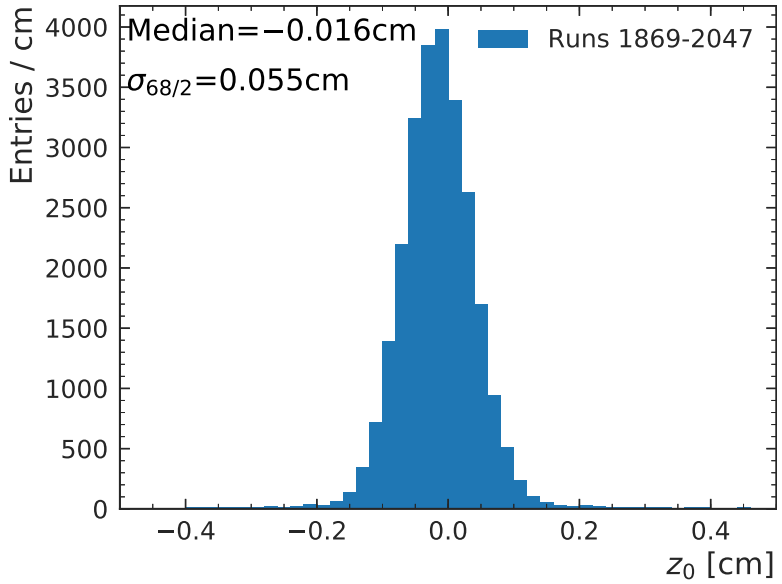




- Explicitly remove SVD linked tracks for this study
- After initial run 112-140 which had very high background, a number of runs with much improved background and varying collision point conditions.
- Since run 1869, stable conditions, reasonable background.

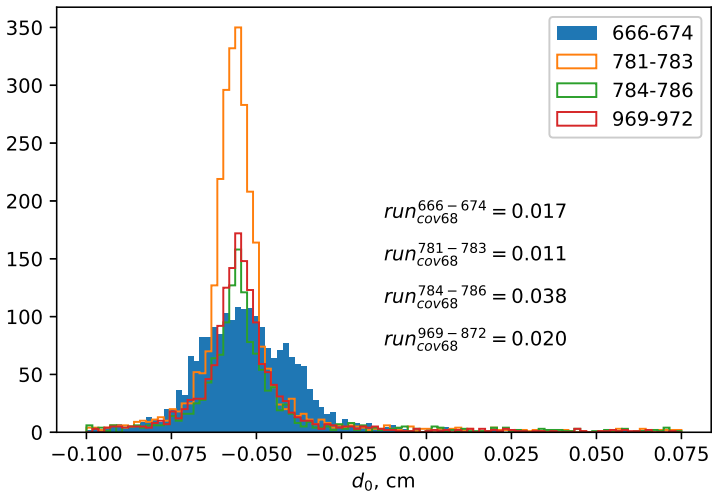
Z_0 run dependence

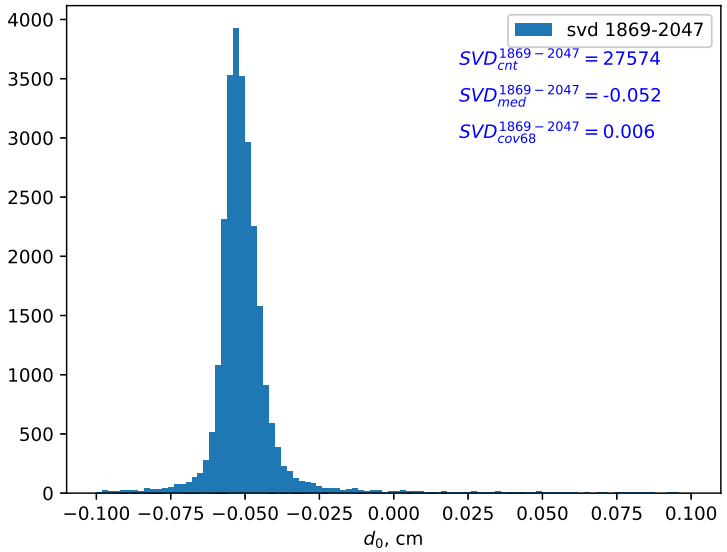




- For the collision region, clearly visible variation of z_0 vs run.
- Stable since run 1869. Spread of the beam spot in z is not unfolded for the expected z_0 resolution.
- The plot on r.h.s. is to be made public.

d_0 run dependence





- Global offset: appears after alignment to CDC
- Some variation, wide spread for old runs, becomes better for recent runs

Summary

- Early tracking studies provide important information for the machine tuning
- Preliminary alignment is important to improve resolution
- Stable conditions for the last lumi runs: can be illustrated by the z_0 distribution.
- Bhabha events can be used for more detailed studies of the tracking performance.