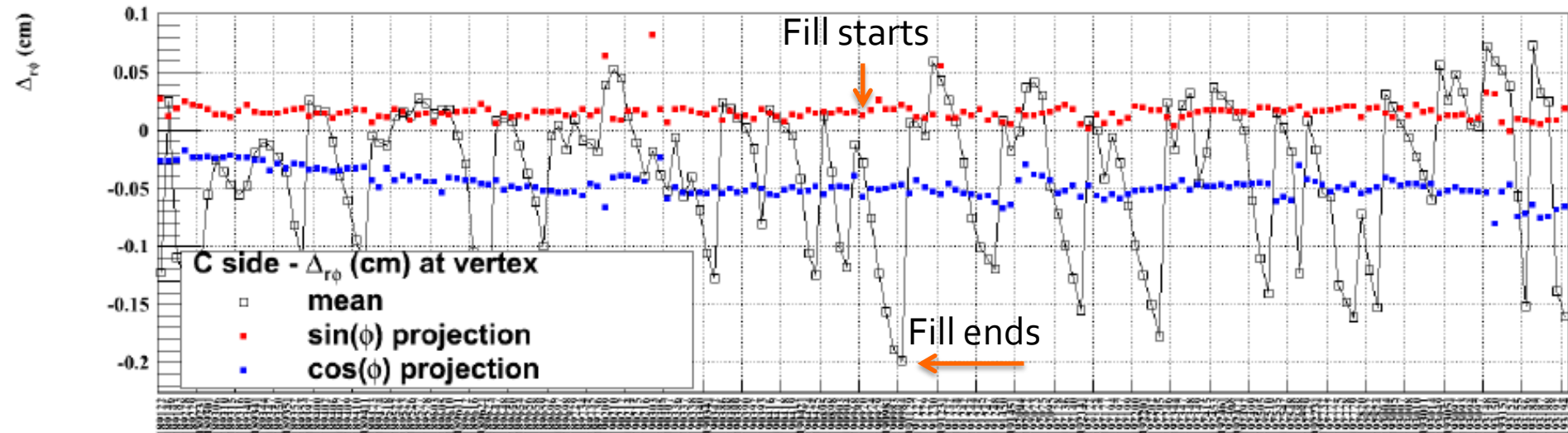


Calibration over more than one run

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Use case: spatial distortions at high IR



Charging up of inner field cage observed on C - side

Depends on **interaction rate x primary ionisation** ($\text{Ar} \approx 2.0 \times \text{Ne}$)

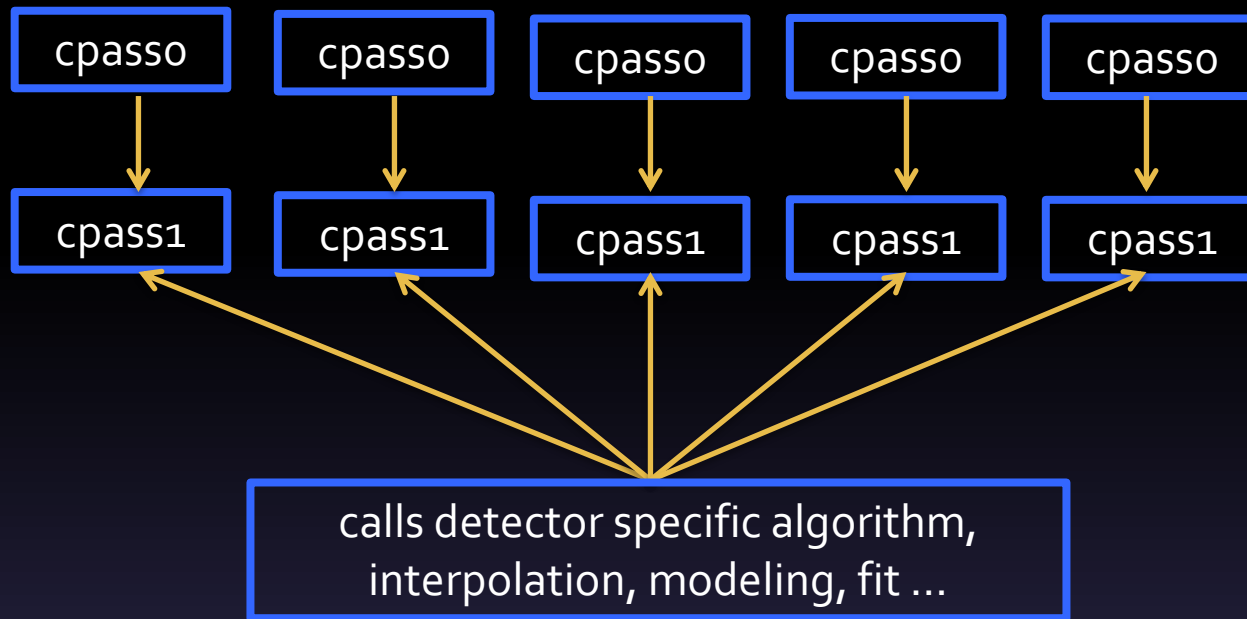
Spatial distortions, i.e. $\Delta r\phi$ at vertex could reach 5mm in run 2

→ Time dependent ! Clear structures within fill

→ Need **time-dependent** space point calibration, **per fill**

→ Use **external detectors**, i.e. ITS, TRD, TOF, for calibration

Calibration per LHC fill



- Cpass1 starts right after cpasso finished for a run
- (A) make cpass1 output for all runs of an LHC fill available
- 1 run might last as long as 1 LHC fill (up to 24h)
- run1: 1 calibration object created per time interval, e.g. drift velocity each 15 min
- (B) Issue: memory consumption
 - convert cluster-to-track residual histograms to distortion maps (each 30 min)
- Model + fit to calibration output over 1 LHC fill → continuous space point correction

Proposal

- Goal: automated scheme for calibration
- Lego train: manual intervention
- Minimize usage of resources:
 - (A) filling of cluster-residuals histos or trees in cpass1,
 $O(10^4)$ jobs
 - (B) creation of distortion maps $O(10^1)$ jobs
 - Run on grid (alien jobs)
 - alternatively / interim solution as cron jobs at GSI

Action items

- In advance to data taking:
ITS, TRD, TOF alignment with sufficient precision
(interpolation error inside TPC $< 200 \mu\text{m}$, intrinsic tracklet resolution)
- ITS-TRD-TOF interpolation method, available as macro, needs to be ported to TPCcalibration class
- Define minimum granularity of residual histos, decide whether to use histos or trees depending on memory consumption vs CPU time

Action items, cont'ed

- Fit distortion maps with physics model to confirm understanding
- distortion maps + linear interpolation in time for ultimate precision
- Statistics required for 0.1mm target resolution:
 - 180 bins in ϕ x 10 bins in θ x $(3.5\text{mm}/0.2\text{mm})^2$
 - 5×10^5 tracks, 1×10^4 pp collisions @50 Hz
 - each 2000 s \approx 30 min (for ITS-TOF)
 - TRD needs 4x less statistics, 8 min