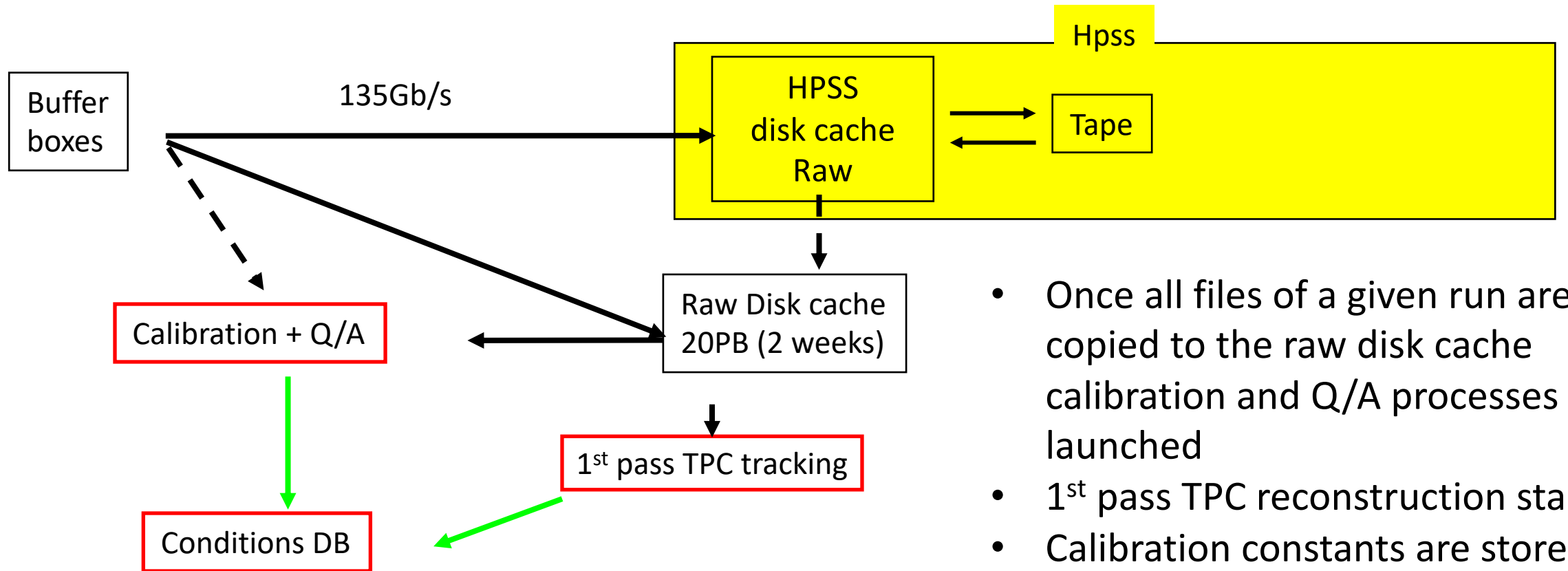


Calibration parameters for infrastructure discussion

Yasser and Takao

Calibration scheme

C. Pinkenburg at S&C review (Sep 2019)



- Once all files of a given run are copied to the raw disk cache calibration and Q/A processes are launched
- 1st pass TPC reconstruction starts
- Calibration constants are stored in the conditions DB

- Calibration processes can also be run on local resources in the sPHENIX counting house where they would directly read from the buffer boxes
- Once all calibrations and Q/A processes finished successfully a run is ready for reconst.

Parameters divided in several timescales

- Production timescale
 - Before run-start
 - Instantaneous (as soon as data is taken)
 - Needs XXX events
 - Can be obtained after scanning whole event
- Application timescale
 - Has to be applied before mini-DST production (calibration DST)
 - Prior to full-DST production
 - At analysis stage

INTT/MVTX production timescale and paras

	Before run	Instantaneous	Needs XXX events (and mini-DST)	After a run	Frequency
Initial geometry (survey, cosmics)	Yes (dx, dy, dz, yaw, roll, pitch)				Once per run or lifetime
On beam alignment check			Yes (dx, dy, dz, yaw, roll, pitch)		Occasionally, e.g. carriage move. 1M
DAC, FIFO, digital scan	Per-channel				Occasionally?
Threshold tuning/scan	Per-channel				Occasionally?
temperature			Every an hour?		

INTT/MVTX application timescale and paras

	Prior to mini-DST production	Prior to full-DST production	At analysis stage	Frequency
Initial geometry (survey, cosmics)	Yes (dx, dy, dz, yaw, roll, pitch)			
On beam alignment check		Yes (dx, dy, dz, yaw, roll pitch)		Occasionally, e.g. carriage move
DAC, FIFO, digital scan	Yes, per-channel			
Threshold tuning/scan Noise occupancy	Yes, per-channel			
temperature			Every an hour?	

TPC production timescale and paras (I)

	Before run	Instantaneous	Needs XXX events (and mini-DST)	After a run	Frequency
Initial geometry (survey, cosmics)	Yes (dx, dy, dz, yaw, roll, pitch)				Once per run or lifetime
On beam alignment check			Yes (dx, dy, dz, yaw, roll, pitch)		Occasionally, e.g. carriage move. 1M evts
GEM gain	Per GEM module	Using Laser and T			Every ~ 10 minutes?
Gas pressure					Every ~ 10 minutes?
Pad-to-pad gain balancing	Per-channel		Charge sum for each pad		

TPC production timescale and paras (II)

	Before run	Instantaneous	Needs XXX events (and mini-DST)	After a run	Frequency
TPC distortion (Statistical)	Yes				
TPC distortion (Fluctuation)		Digital current (Sum of ADC)			Every ~1msec
Drift velocity	Per GEM module		Using Kalman fit (vd as free)		Every ~10 minutes?
Absolute hit positions		Using distortion correction			Every ~ 1msec

TPC production application timescale (I)

	Prior to mini-DST production	Prior to full-DST production	At analysis stage	Frequency
Initial geometry (Survey, cosmics)	Yes (dx, dy, dz, yaw, roll, pitch)			
On beam alignment check		Yes (dx, dy, dz, yaw, roll pitch)		Occasionally, e.g. carriage move
GEM gain	Yes, per-module			As a function of T and P
Gas pressure	Yes			Every ~ 10 min?
Pad-to-pad gain balancing	yes			Per XXX events

TPC production application timescale (II)

	Prior to mini-DST production	Prior to full-DST production	At analysis stage	Frequency
TPC distortion (Statistical)	Hopefully			Good question
TPC distortion (Fluctuation)		Hopefully		Every ~1msec
Drift velocity		yes		Every ~10 minutes?
Absolute hit positions		Hopefully		Every ~ 1msec

EMCAI/HCal production timescale and paras

	Before run	Instantaneous	Needs XXX events (and mini-DST)	After a run	Frequency
Initial geometry (survey, cosmics)	Yes (dx, dy, dz, yaw, roll, pitch)				Once per run or lifetime
On beam alignment check			Yes (dx, dy, dz, yaw, roll, pitch)		Occasionally, e.g. carriage move. 1M
Non-linearity	Per-channel			Pi0, J/psi, gamma-jet?	
Absolute energy calibration	Per-channel			Pi0, J/psi, gamma-jet?	
Gain balancing among modules			Every an hour?		LED events

EMCal/Hcal application timescale and paras

	Prior to mini-DST production	Prior to full-DST production	At analysis stage	Frequency
Initial geometry (survey, cosmics)	Yes (dx, dy, dz, yaw, roll, pitch)			
On beam alignment check		Yes (dx, dy, dz, yaw, roll pitch)		Occasionally, e.g. carriage move
Non-linearity		Hopefully		
Absolute energy calibration			Probably here	
Gain balancing among modules	Every an hour?			LED events

Discussion

- Estimate computing resources for calibration?
 - E.g. Digital current → TPC distortion map would need a lot
 - Figuring out the magnitude of the distortion.
 - Outer detector necessary?
- Are the interfaces to calibration modules defined?
 - For automatic calibration and QA
- Definition of calibration classes
- Would need to refine parameters and timescale (frequency)

backup

Calibrations

- Calibrations are time based with a granularity of one second
 - Need to go to ms granularity for TPC distortion correction
- We plan to calibrate run by run for other detectors, the maximum length of a run is given by the time calibration constants are stable
- Initial one time calibrations must be done quickly to start reconstruction (e.g. alignment), estimate about 2 weeks to produces those
- Calorimeter Laser/LED/Pedestal events copied to separate stream, enabling efficient processing of all those events
- Run-wise calibrations kicked off after run is transferred to hps
 - Uses a deterministic subset of the data (unlike monitoring) and is therefore 100% reproducible
 - Typically a few hours later calibrations (except TPC) are done
 - TPC requires full tracking for distortion correction
 - Run also Q/A to flag questionable runs
 - final calibrations applied during separate pass or analysis (“recalibrators”, framework hooks for those exists)

Calorimeter part

High Level calibration (needs descent statistics)

- Quarkonium reconstruction
- Gamma-jet, J/psi