

ATO292 - AliRoot and TPC fast pile-up simulation

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Motivation

Current simulation of the TPC response in AliRoot not sufficiently realistic

Missing parts:

- ion tail and crosstalk/common mode effect simulation
- pile-up simulation ($O(80)$ pileup events in TPC) in Run2 - 400kHz)

Simulation of both aspects were implemented, but not used because of the CPU consumption

In order to make a more realistic simulation with minimum additional resources a fast pile-up simulation was proposed

- ATO-292] AliRoot and TPC fast pile-up simulation - ALICE Collaboration
 - <https://alice.its.cern.ch/jira/browse/ATO-292>

current implementation AliGenPileUp:

- Simulate full events - hits shifted in time

• AliGenPileUpFast - Fast simulation:

- simulate Nevents and event time distribution according filling schema and mu
- takes randomly events (SDigits) from pools
- provide event index in SDigitsArray + time descriptor to the AliDetectorDigitizer - information should be propagated to STEERING class which runsSDigitst2Digits (AliRun??? - to ask Peter, Cvetan)
- adding time offset information to the STEER/STEER/AliDigitizationInput.h
- treatment of delay, acquisition window, detector specific.
- AliDetectorDigitizer - takes events in from of signals - shift them resp. suppress them - if outside of readout time

• Questions:

- How the pulls are created ?
- Where they are stored?
- How they are used ?

How the pulls are created ?

Proposal:

- 1.) run standard MC production storing also SDigits files
- 2.) merge several inputs to make larger pull O(4000) events per zip archive
 - here we expect O(1MBy) per event (assuming size like in raw data without pile-up to be checked)

How to use them?

- 1 SDigit archive to be used
- Option 1: job splitted - MC done on node with SDigit pull
- Option 2: copy to sandbox

should be faster as we will reuse events several times

TPC: AliTPCDigitizer::DigitizeWithTailAndCrossTalk to be used

- signal shifted in time (according AliDigitizationInput.h) and cut on the edge of acquisition window

Option already discussed before, during PB PB discussion

Argument about the precision of the space point distortion information

• Answer:

- For TPC, all aspects simulated: e.g diffusion, space point distortion, attachment are depending on the drift length ($\sim z$) and they are independent of the actual timing.
- Shifting the signal time and applying time acquisition window, is quite realistic way to simulate pile-up in the TPC.

ITS, TRD should be the same

- others to communicate

Conclusion

Current MC simulation of the high IR data not sufficiently realistic

Pileup and corresponding signal modification not simulated

Can impact quality of the efficiency and resolution corrections