Update from TPC

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Status of the digitization

	Start	Planning	Geometry	Hits	Digits	Ready
TPC			✅	✅	✅	

- Full implementation of the signal creation in the detector
- Full integration in the DPL

- Result of the latest code sprint – Sandro Wenzel, Jens Wiechula, AM
  - Re-write integration to DPL
  - Code review & optimisation (benchmarking, …)

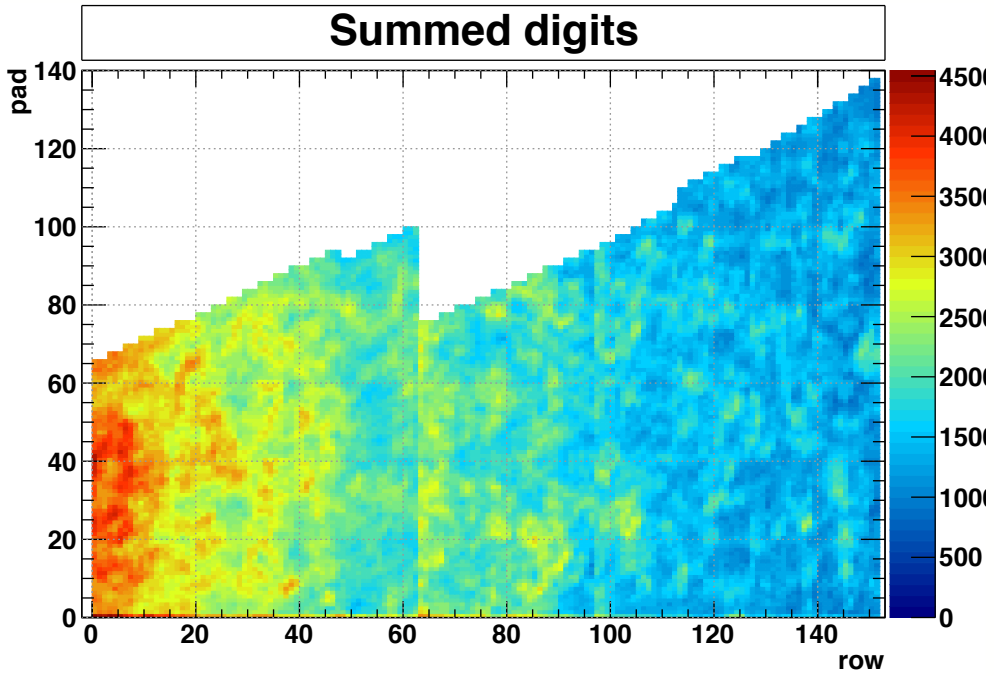
	20 box events; all sectors; 1 lane (avg. time / sector)	5 PbPb events; 4 sectors; 1 lane (avg. time / sector)
before	4.25 s	9.06 s
after	0.175 s	2.91 s
improvement	**24.28**	**3.11**

To be done, open problems & questions

- Further improvements, verification and tuning of the physics
  - Workflow optimization
  - Usage of o2::configurableParam throughout the TPC code

- Open problem: Significantly more digits in pad 0 of every row
  - Under investigation

- Questions
  - Plans for default CCDB? Something comparable to AliRoot?
    - Dedicated git repository
  - Needed e.g. for pedestals
    (use the same pedestals in digitization and clustering)

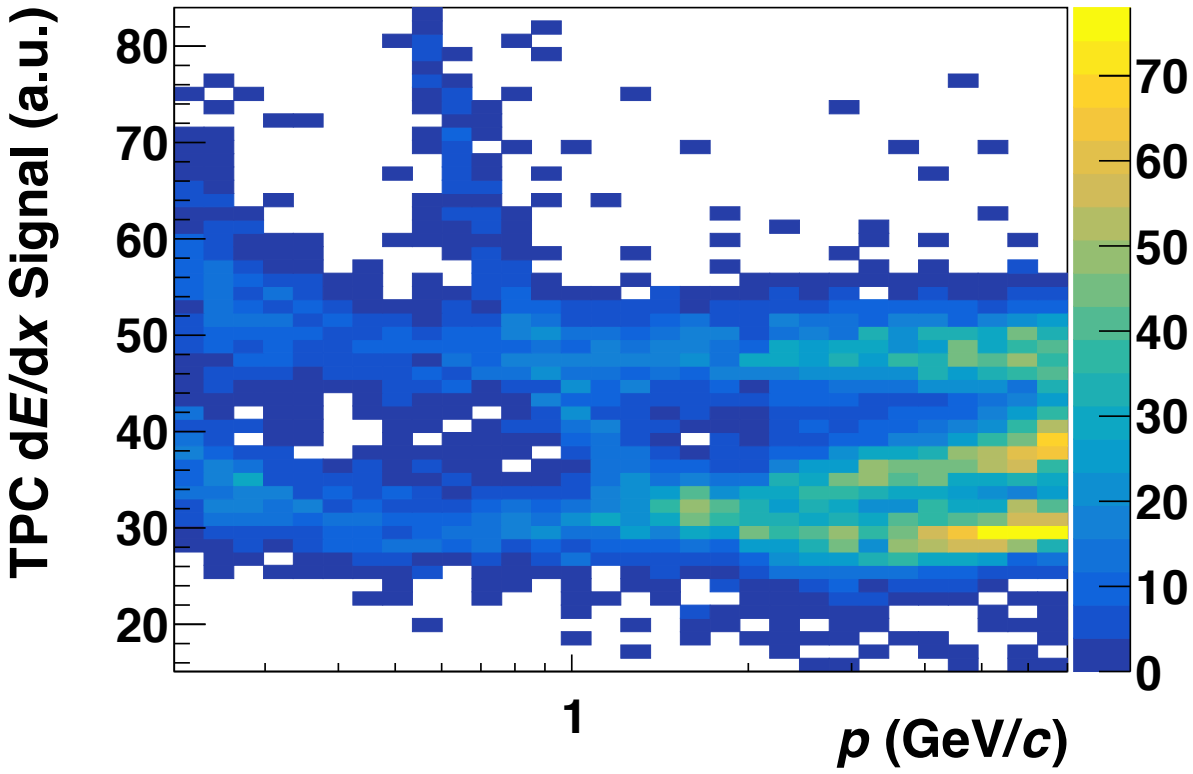


TPC d*E*/d*x* calculation

Matthias Kleiner

- Calculation and calibration of the specific energy loss measurement
- Reconstruction algorithms will run on GPUs (based on David Rohr's code)

- So far: correction on the pad length.



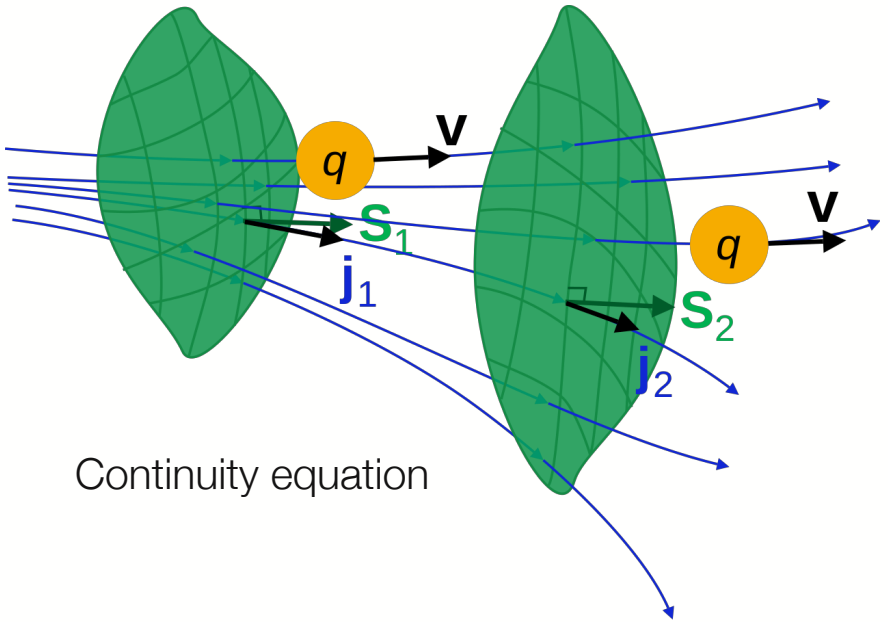
Space-charge simulation

Current status

- Constant space-charge distortions applied in digitization (Ernst Hellbär)
- Distortion interface for TPCFastTransform structure to be used in reconstruction (#1738 pending) (Sergey Gorbunov)

Work in progress

- Realistic space-charge evolution over time (Ernst)
  - Ion density movement along the distorted electric field
  - Numerical method using feedback loop (*slow simulation*)
    - Validation of digital-current based space-charge distortion calibration
    - Input for machine learning developments
- Convolutional neural network to speed up the distortion map calculation (Rifki Sardin, Marian Ivanov; soon maybe also Taku's group)
  - Test also TensorFlow interpolation



Continuity equation

Distortions calibration

With residuals (Ole Schmidt)

- AliRoot code is being ported to O2
- Extraction of distortions from residuals done (still using old AliRoot format, yielding compatible results)
- Currently working on the creation of the residual trees

With integrated currents

- CNN is working and currently being tests

Data compression

David Rohr, Michael Lettrich

Entropy-based compression

- First results promising > 150 MB/s
- At $\mathcal{O}$(3 GB) TPC raw clusters per TF → < 20s (comparable CPU to sector track finding)
- Slightly faster than first estimate

Track-based compression

- No news

Verification & QA

Testbeam of 4-GEM IROC at CERN PS (Thomas Klemenz)

- Final design ROC from the pre-production
  - First version of the SAMPA
- Comparison and tuning – work in progress

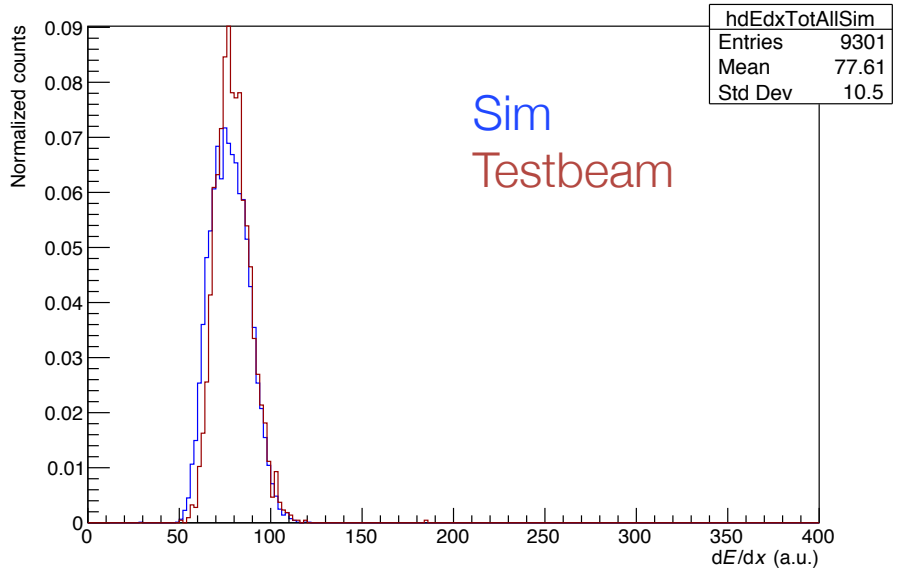
Comparison O² – AliRoot (Hermann Degenhardt)

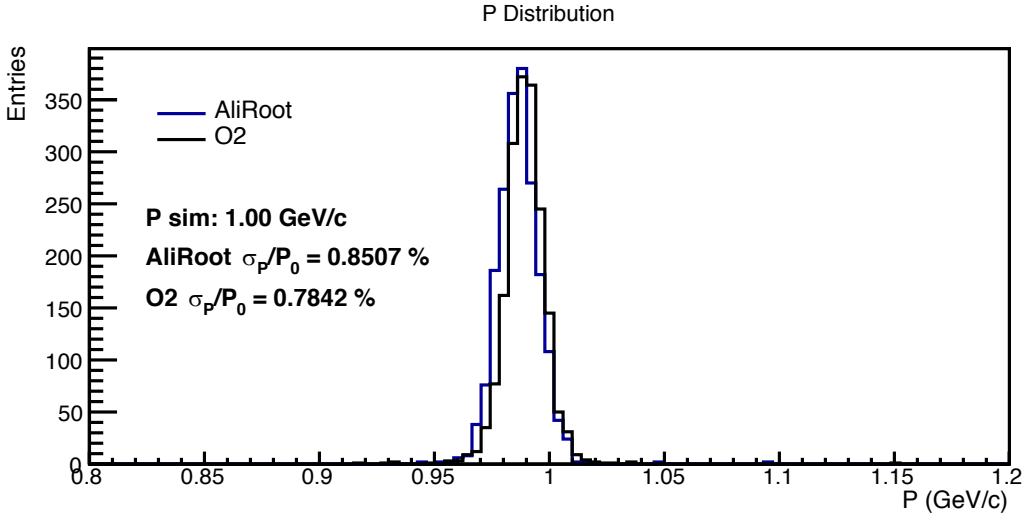
- Angular & p_T resolution
- V_0 mass resolution (Λ and K^0)
- Goal: Implementation of regression tests

Basic QA modules (clusters, tracks)

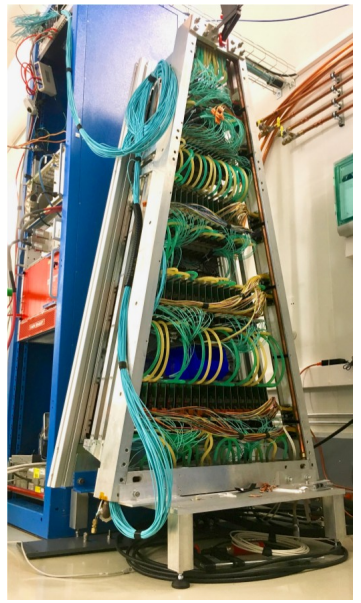
Institute responsibility TU Munich

- Kick-off meeting end of April





Plans for data taking in 2019



TPC sector setup

- Currently 4 CRUs on a TPC sector (will be 10)
- Study the performance of the ROC
- Also: pedestals, calibration, data flow, …

TPC tests in the cleanroom (starting Oct. 2019)

- Services will be available – 20 CRUs (about 10 FLPs)
- Validation of the readout chain and calibration
  - Has to be functional and sufficiently tested by that time!
- Coordinate the effort → combined meetings and a detailed plan will follow

- More details: FLP Meeting

	Pedestals	Pulser	Laser	Cosmics	X-Ray
Raw GBT					
Decoded Raw					
Zero suppressed					
Clusterized					
+ Tracking					

Main data taking mode
Alternative mode
For cross-checks (limited statistics)

Summary

- Digitization: Verification and tuning of the physics
- Space-charge simulation
  - Constant space-charge distortions applied in digitization
  - Distortion interface for reconstruction ready
- Space-charge calibration with residuals: Code ported to O^2, results are compatible
- Data compression: First results of entropy-based compression are promising
- QA effort is starting
- Dedicated test of the data flow, calibration, … forseen in 2019