



Track Reconstruction News

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004761.



Key4HEP

- Andreas Salzburger is investigating DD4hep's DDRec surfaces
 - ACTS should ultimately handle these, likely via detray
 - Would ease importing ILC & CLIC tracking geometries
 - Frank Gaede expressed a strong interest towards this work



Gaussian Sum Filter

- Benjamin Huth took over the Gaussian Sum Filter task
 - Initially envisioned as an IJCLab ATLAS qualification task, but ultimately deemed too broad
 - He has a first prototype of a multi-component propagator



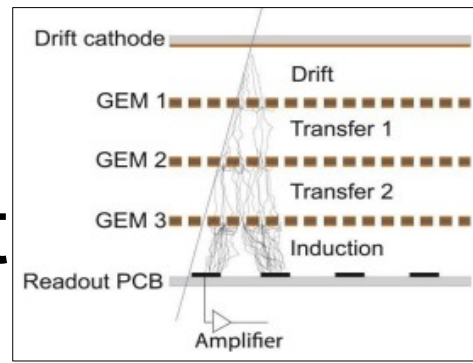
More news from CERN group

- Open Data Detector & dataset preparation
- Submitting a paper on ACTS to CSBS
- ITk integration work

Development of Machine Learning algorithms for Micro Pattern Gaseous Detectors

- Timeline and task: 4 years
 - First year: uRWELL simulation & implementation of resistive layer
 - Second year: development of cluster selection and track finding
 - Third year: track cleaning and refinement
 - Fourth year: application to IDEA detector pre-shower and muon & optimization
- Deliverables
 1. A scientific paper describing the performed activity and the results.
 2. An open-source software suite for training and testing ML algorithms with MPGD data and simulations.
- The group
 - INFN Bologna: main sub-task & porting and integration with IDEA general framework
 - INFN Ferrara/Torino: MPGD parametric simulation, uTPC development and ML algorithms
 - INFN Frascati Laboratory: responsible for uRWELL technology and test beam data
 - INFN Ferrara/Torino and IHEP (Beijing): tracking and ML development
- First Post Doc Position just opened on this task

Simulation and ML development



For triple-GEM, a parametric simulation which includes diffusion, transparency, gain, induction and readout electronics was developed

Tuning to test beam data ☾ both charge and time readout for CoG and uTPC cluster reconstruction.

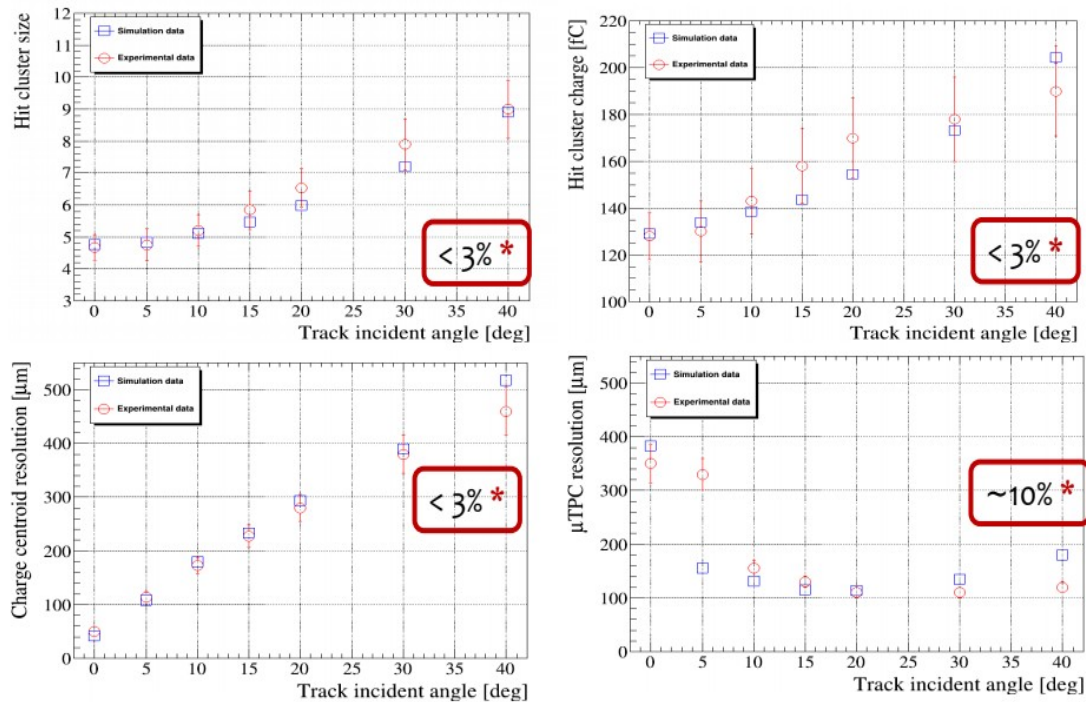
R. Farinelli and L. Lavezzi, RD51 coll. Meeting - Oct 2019

Goal I: extend the simulation to uRWELL (in progress, see next slide)

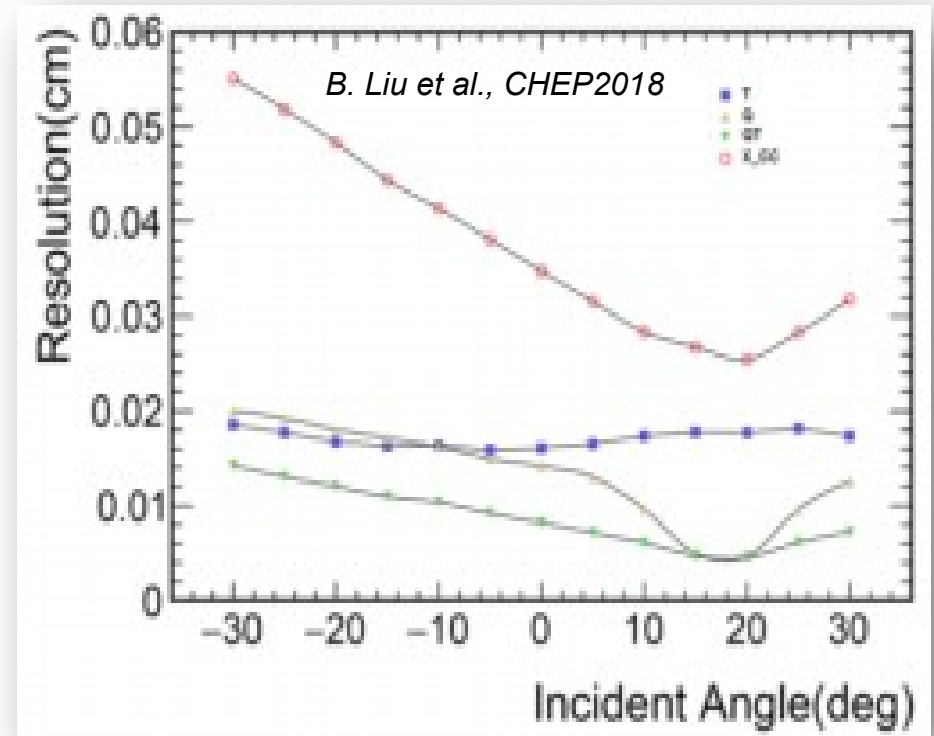
Goal II: develop general purpose Machine Learning tracking algorithms for MPGDs

Tuning to real data

Best result $\chi^2/\text{NDF} \sim 3 \leftarrow \text{gain tuning} = 6.8 \leftarrow \text{diffusion tuning} = 1.5$

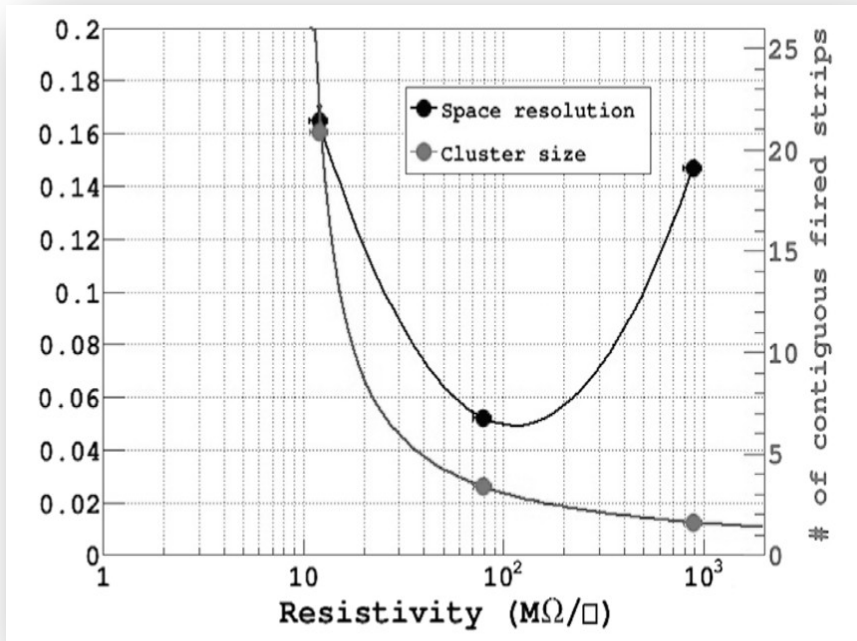


* (experimental - simulated)/experimental



Simulation and ML algorithms will be developed in the general IDEA framework

uRWELL simulation



Resistive simulation – **in progress**

Describe the charge dispersion at the anode which depends on the time constant determined by the DLC surface resistivity and the capacitance per unit area

Use the approach from *Nucl.Instrum.Meth.A566:281-285,2006*

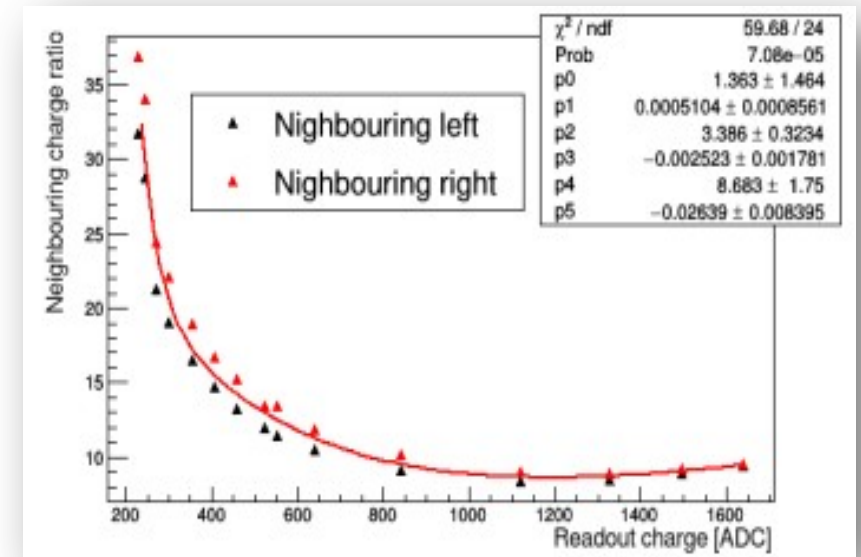
The simulated spatial and temporal charge evolution will be convoluted to the intrinsic rise-time of the detector and the electronics shaping time effects and then compared with results from test beam

Interstrip induction studies – **planned**

To be added to the simulation

Will Studied by means of hardware measurements on the readout planes

The probability to induce a signal on neighbor strip will be studied as a function of the charge readout by the central strip, and the relative delay between the two signals (central strip and neighbor)



Belle 2

- Hadrien Grasland got in touch with the Bonn group
 - Clarified current status of B2 ACTS experiments
 - Main roadblock : surface-less detector support (for CDC)
 - Andreas Salzburger & Fabian Kimpel reworking Stepper, towards a Free Kalman Filter that should enable this
 - Also of interest to the sPHENIX team
 - See <https://github.com/acts-project/acts/issues/165>

GPU R&D

- Lots of tracc work, some of which may fall outside of AIDA* :
 - ACTS Fatras data input (Beomki)
 - Event Data Model rework for GPU-friendliness & more CPU/GPU code sharing (Attila, Beomki, Stephen)
 - Another CUDA clustering (CCA) implementation by Stephen
- On IJCLab side, Sylvain Joubé just got a PhD grant, and is comparing SyCL's various memory transfer APIs

* Apologies, I'm not super up to date on affiliations and prepared this talk on a short notice...



More news from IJCLab

- Postdoc search in progress
 - See <https://inspirehep.net/jobs/1869622>
 - Already seeing some promising applicants



Conclusion

- Quite a bit of progress already, will get faster with new recruits
- Intend to implement previously discussed meeting schedule
 - Alternating bi-monthly WP12 and tracking meetings

Thanks for your attention !