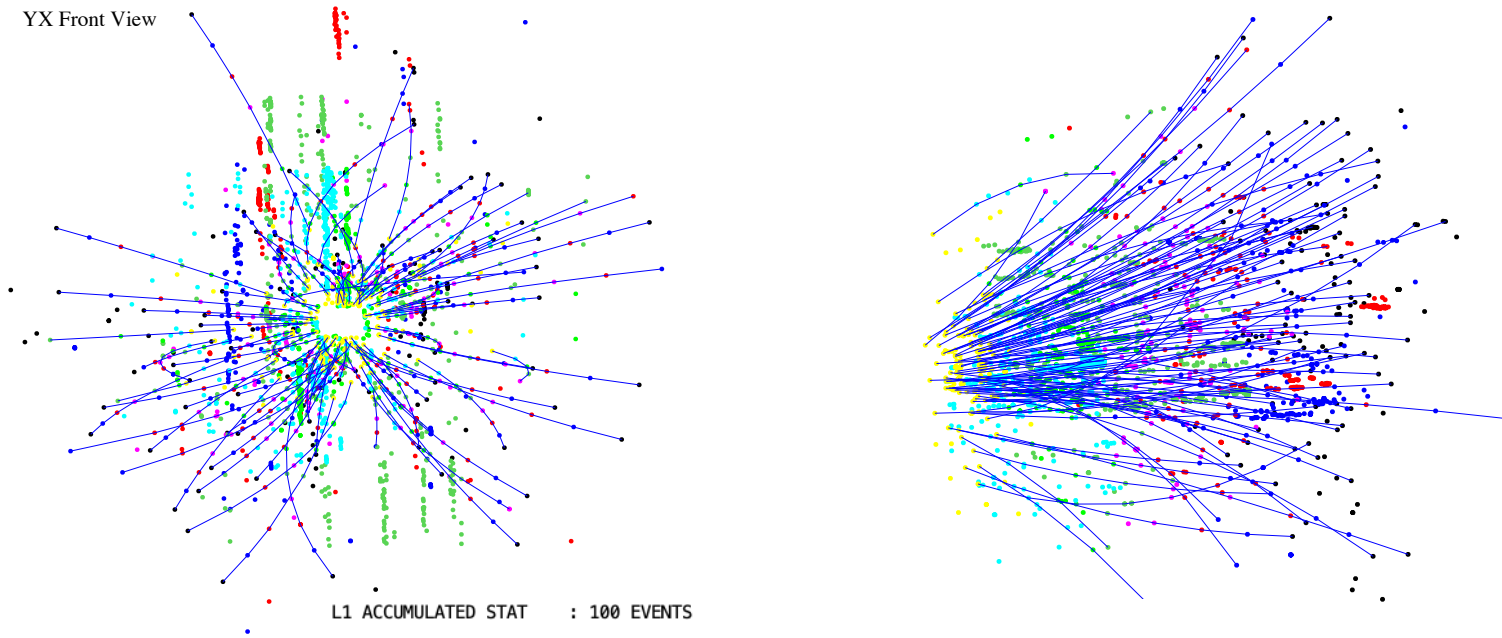


# Frankfurt: Work with Standalone CBM CA Track Finder

- ☑ Two PhD students for 1/2 position August 2019 - December 2020
  - Vectorization and parallelization of the algorithms (CA track finder)
  - Kalman filter for search of short-lived particles (KF Particle package)
- ☑ Learn finding of tracks by the cellular automaton, and fitting tracks by the Kalman filter in CBM
- ☑ Investigate specific features of the CA implementation for strip and pixel detectors in non-homogeneous magnetic field
- ☑ Isolate and make a standalone version of the CBM CA track finder

YX Front View



L1 ACCUMULATED STAT : 100 EVENTS

Track category	Eff	Killed	Length	Fakes	Clones	All Reco	All MC
LongRPrim efficiency	: 0.999	/ 0.000	/ 0.969	/ 0.004	/ 0.003	/ 5589	5596
RefPrim efficiency	: 0.971	/ 0.003	/ 0.965	/ 0.013	/ 0.003	/ 8233	8483
RefSec efficiency	: 0.811	/ 0.013	/ 0.930	/ 0.017	/ 0.001	/ 936	1154
Refset efficiency	: 0.951	/ 0.005	/ 0.961	/ 0.014	/ 0.002	/ 9169	9637
Allset efficiency	: 0.888	/ 0.007	/ 0.953	/ 0.016	/ 0.002	/ 13496	15204
ExtraPrim efficiency	: 0.913	/ 0.005	/ 0.940	/ 0.020	/ 0.002	/ 3429	3755
ExtraSec efficiency	: 0.496	/ 0.025	/ 0.922	/ 0.022	/ 0.000	/ 898	1812
Extra efficiency	: 0.777	/ 0.011	/ 0.936	/ 0.020	/ 0.001	/ 4327	5567
Ghost probability	: 0.007	94					
MC tracks/event found	: 134						

CA Track Finder: 0.005 s/ev

# Frankfurt: Work with ACTS - Installation and Tests

- ✓ Start with a Kalman filter track fit example of Xiaocong Ai
- ✓ Communicating with the author to implement the whole chain and reproduce his results
- ✓ Simulation were done with ACTFWGenericFatrasExample using Pythia8
- Preparation of CA interfaces for ACTS data format is in progress

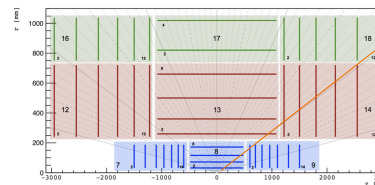
## Track parameter pull from KalmanFitter in ACTS

Xiaocong Ai  
UC Berkeley

Jun 20, 2019

```
14:14:23 EventFilesRa VERBOSE Matching file event000000000-particles.csv
14:14:23 EventFilesRa VERBOSE Detected event range [0,0]
14:14:23 Sequencer INFO Added reader 'CsvParticleReader'
14:14:23 EventFilesRa VERBOSE Matching file event000000000-hits.csv
14:14:23 EventFilesRa VERBOSE Detected event range [0,0]
14:14:23 Sequencer INFO Added reader 'CsvPlanarClusterReader'
14:14:23 Sequencer INFO Added algorithm 'HitSmearing'
14:14:23 Sequencer INFO Added algorithm 'TruthTrackFinder'
14:14:23 Sequencer INFO Added algorithm 'ParticleSmearing'
14:14:23 Sequencer INFO Added algorithm 'FittingAlgorithm'
14:14:23 Sequencer INFO Added writer 'RootTrajectoryWriter'
14:14:23 Sequencer INFO Added writer 'TrackFinderPerformanceWriter'
14:14:23 Sequencer INFO Added writer 'TrackFitterPerformanceWriter'
14:14:23 Sequencer INFO Restrict requested number of events to available ones
14:14:23 Sequencer INFO Processing events [0, 1)
14:14:23 Sequencer INFO Starting event loop with 40 threads
14:14:23 Sequencer INFO 0 services
14:14:23 Sequencer INFO 0 context decorators
14:14:23 Sequencer INFO 2 readers
14:14:23 Sequencer INFO 4 algorithms
14:14:23 Sequencer INFO 3 writers
```

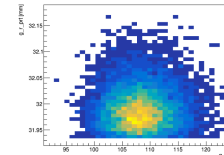
## Test 1 setup



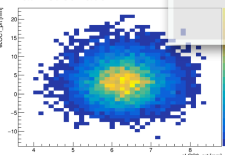
d0 = 0, z0 = 0  
eta = 1.6  
phi = 0  
pT = 10 GeV/c

9995 particles propagated  
to first detector surface at:  
Volume/layer/moduleID =  
8/2/13

global\_r: global\_z predicted  
at first surface



local\_x: local\_y predicted  
at first surface



- An ACTS framework with common (A+F) geometry and simulated data (more like CMS or ATLAS?)
- ACTS Workshop in May at DESY