CA track finder at high track multiplicities V.Akishina, I.Kisel, I.Kulakov, M.Zyzak

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Tracking Challenge in the CBM Experiment

- ✓ Main tracking detector STS
- ✓ Consists of double-sided strip sensors 85% fake combinatorial space points in STS
- ✓ 1000 charged particles/collision, only 1 m length
- Non-homogeneous magnetic field





Efficiency for mbias and central events

Track category	Central event	Mbias event
LongRPrim eff.	99.3	99.4
RefPrim eff.	95.0	96.1
RefSec eff.	79.4	76.8
Refset eff.	92.9	93.8
Allset eff.	85.8	83.8
ExtraPrim eff.	87.2	79.7
ExtraSec eff.	38.4	40.7
Extra eff.	71.0	66.8
Ghost prob.	0.1	0.1
MC tracks/event	587	104



Au+Au 25 AGeV mbias, 8 STS, geometry with o & 8 strip angles.

All set:	p ≥ 0.1 GeV/c
Reference set:	p ≥ 1 GeV/c
Ghost:	purity < 70 %
	All set: Reference set: Ghost:

Track Fit Quality



The track fit resolution is high. Pulls distribution shows correctness of the fitting procedure

Track Finder w.r.t. Detektor Inefficiency



Au+Au central events at 25 AGeV, 8 STS, geometry with o & 15 strip angles.

High reconstruction efficiencyStable w.r.t. the detector inefficiency

Reconstructable track: Number of consecutive MC points ≥ 4

All set: $p \ge 0.1 \text{ GeV/c}$ Reference set: $p \ge 1 \text{ GeV/c}$ Ghost:purity < 70%</td>

Scalability on Many-core System



The CA Track Finder shows strong scalability on many-core systems.

6

CA Track Finder: towards 4D reconstruction

The beam in the CBM will have no bunch structure, but continuous.

Reconstruction of time slices rather then events will be needed. Measurements in this case will be 4D(x, y, z, t).



Packed groups of events:

 ✓ a number mbias events was grouped into one, which was treated by track finder as one event
✓ no time measurement was taken into account



Track finding at low track multiplicity

Average reconstructed track multiplicity: 104/ev



Au+Au mbias events at 25 AGeV, 8 STS, geometry with o & 7,5 strip angles.

Track finding at medium track multiplicity

Average reconstructed track multiplicity:



Au+Au central events at 25 AGeV, 8 STS, geometry with o & 7,5 strip angles.

Track finding at high track multiplicity

Average reconstructed track multiplicity: 13000/ev









XYZ view



10

CA Track Finder: Eff. vs. Track multiplicity



Stable efficiency with respect to track multiplicity

11

CA Track Finder: time vs. Track multiplicity



Time increases as a second order polinom with number of MC Tracks 12



- CA Track Finder for the CBM experiment is stable with respect to track multiplicity.
- The efficiency of the algorithm decreases only by 4% for 100 mbias events in one group.
- The speed of the algorithm decreases as a second order polinom with the number of track.