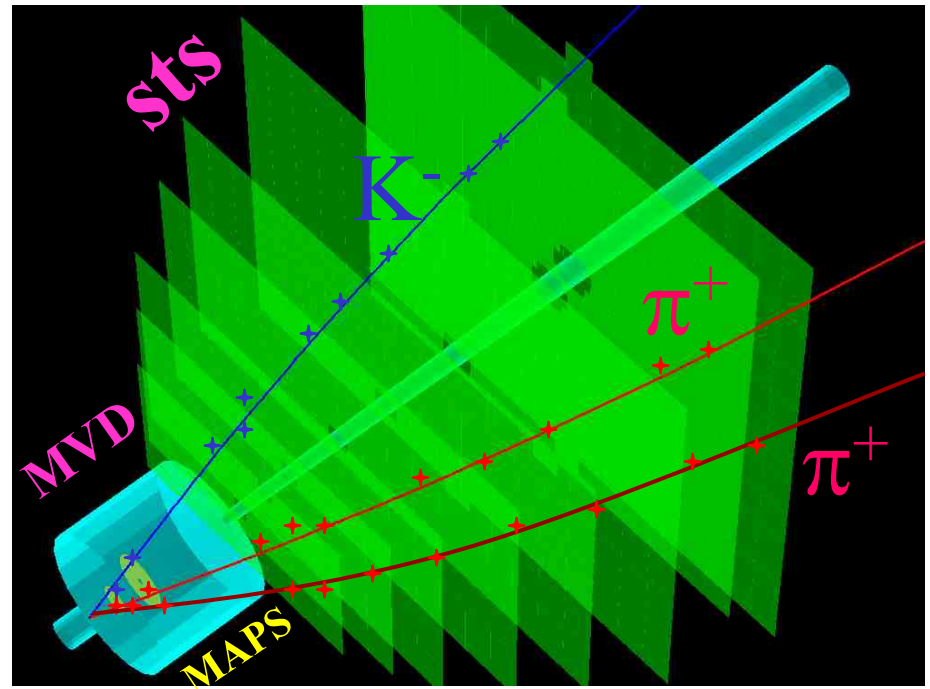
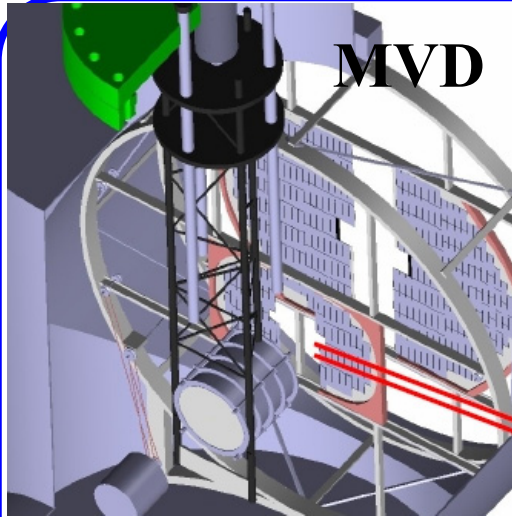


Open charm production in 30 GeV p+A with CBM

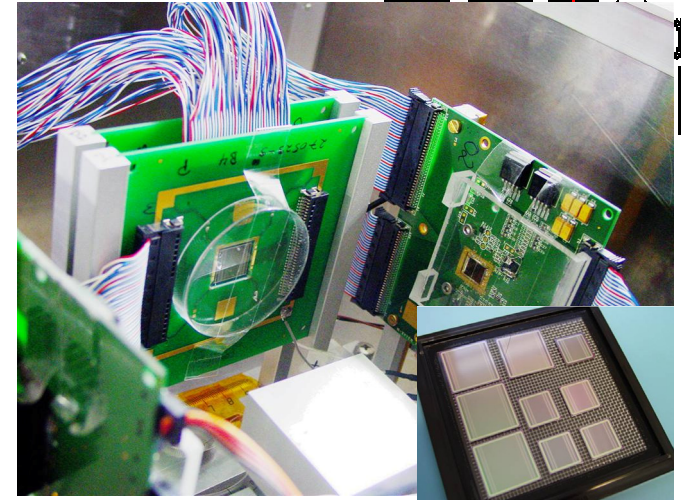
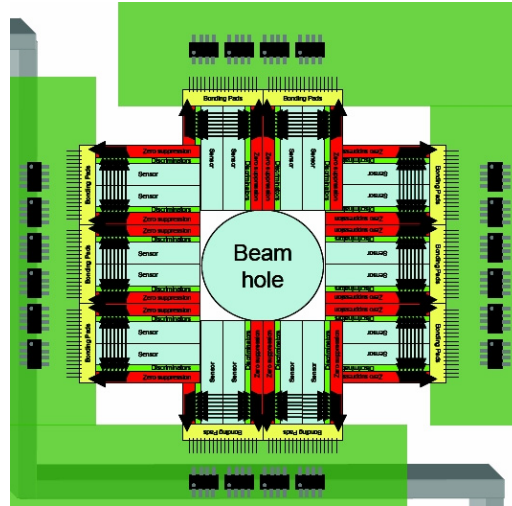
I.Vassiliev,
GSI 27-Apr-2009

- Motivation
- CBM (ultra-light) experimental setup;
- **TOOLS**: cbmroot release 2008,
- background: 10^4 central pC at 30 GeV,
- signal: D^+ multiplicity by HSD;
- Fast SIMDized CA tracking;
- $D^+ \rightarrow K^- \pi^+ \pi^+$ reconstruction;
- Strategy: background suppressions, cuts optimization, S/BG ratios;
- Summary





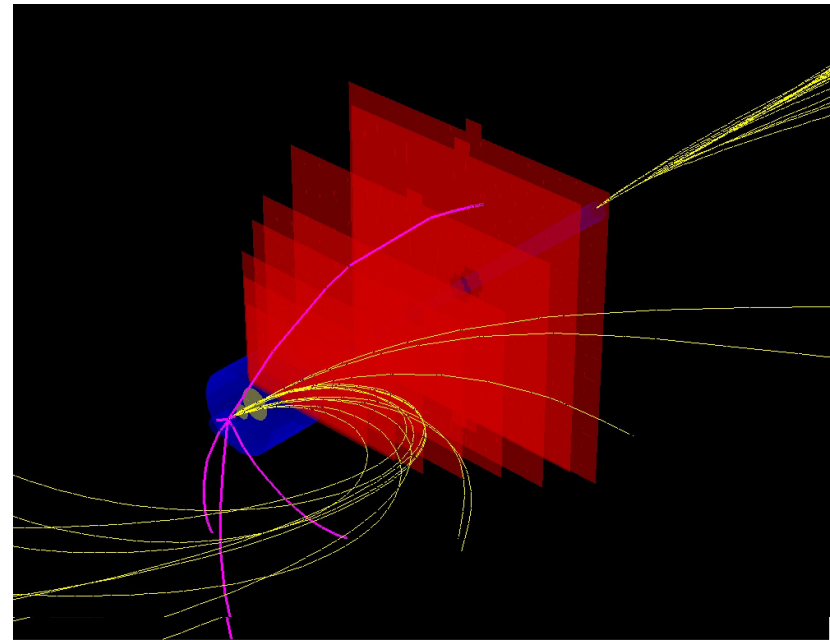
MVD

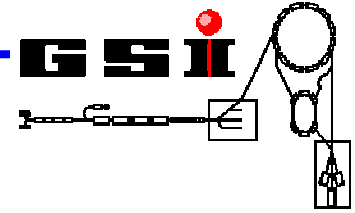


- 10 stations (5, 10, 30, 35, 40, 50, 60, 75, 95, 100 cm) 2 first in vacuum

MAPS: 300 and 500 (μm),
with $10 \times 10 \mu\text{m}$ cell size

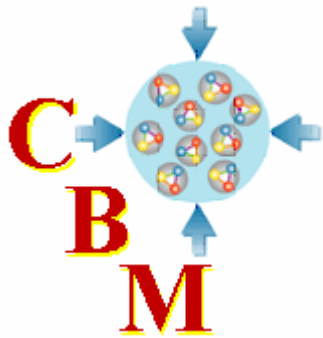
- Strip-detectors (400 μm),
60 μm strip-pitch,
1cm strip length;
- Realistic hit producers;
- δ -electrons in, no pile-up and
clusters for the MAPS detectors





Fast SIMDized CA tracking in STS by I.Kisel

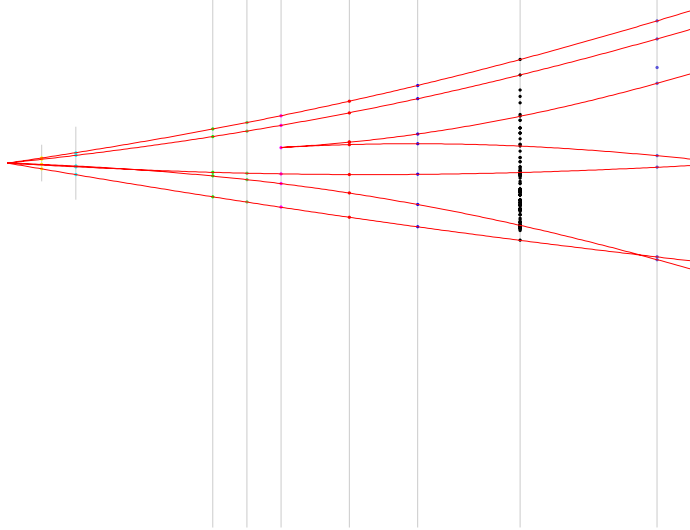
p+C 30GeV



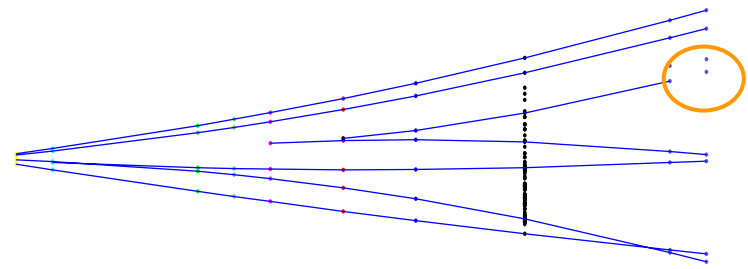
XZ Top View

XZ Top View

MC



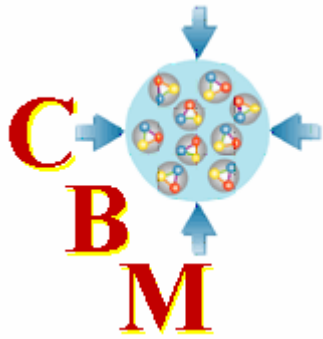
RECO



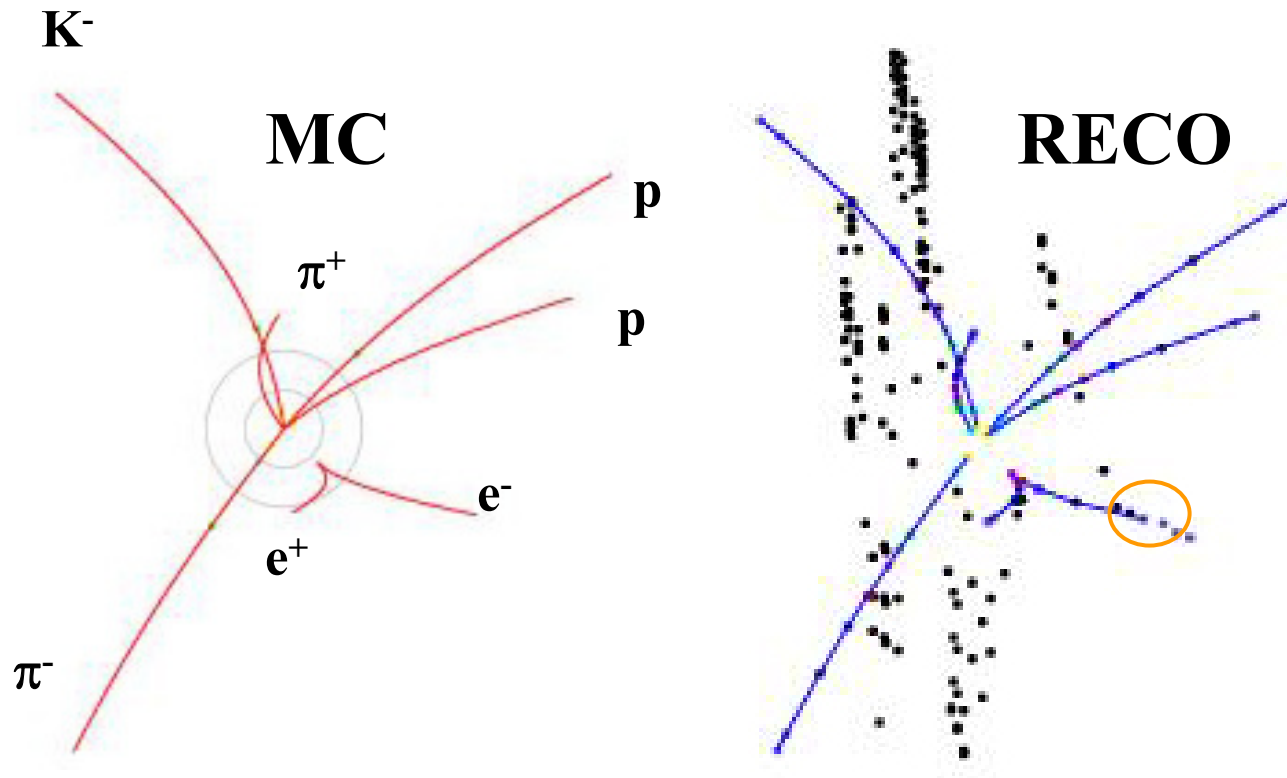
RefPrim	efficiency	: 0.999
RefSec	efficiency	: 0.895
Refset	efficiency	: 0.991
Allset	efficiency	: 0.932
Clone	probability	: 0.023

Fast SIMDized CA tracking in STS
by I.Kisel

$p+C$ 30GeV

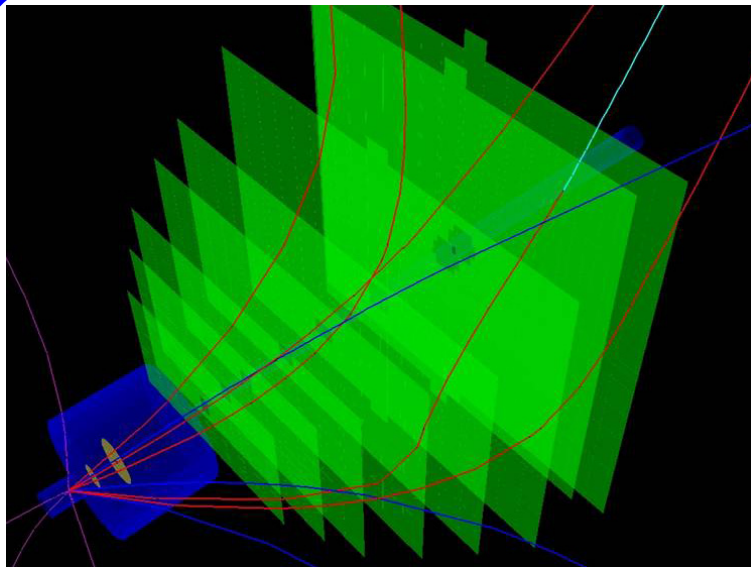


XY Rear View

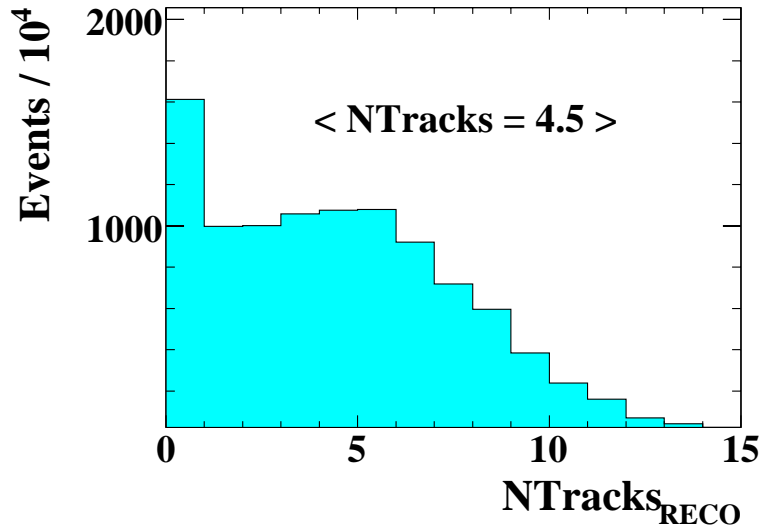
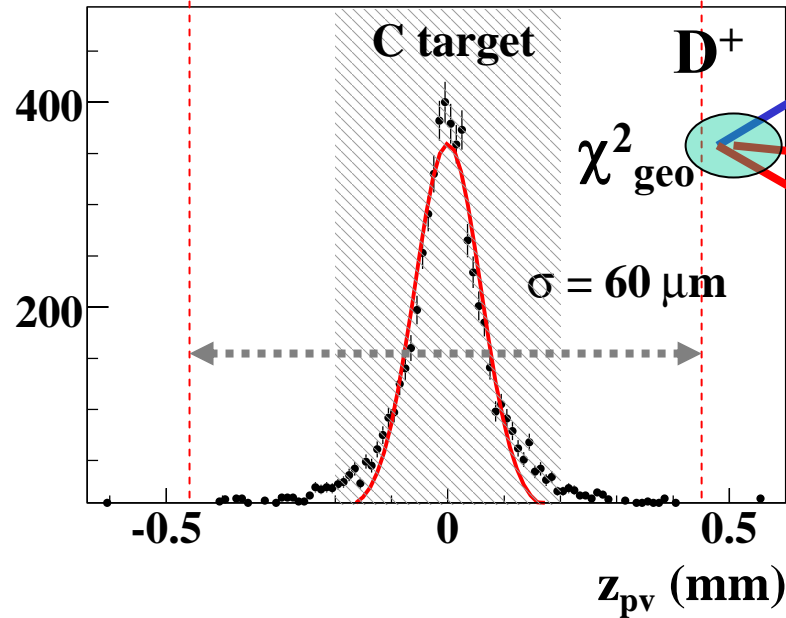


primary vertex reconstruction

pC background control

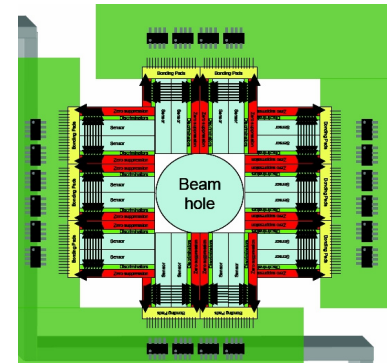
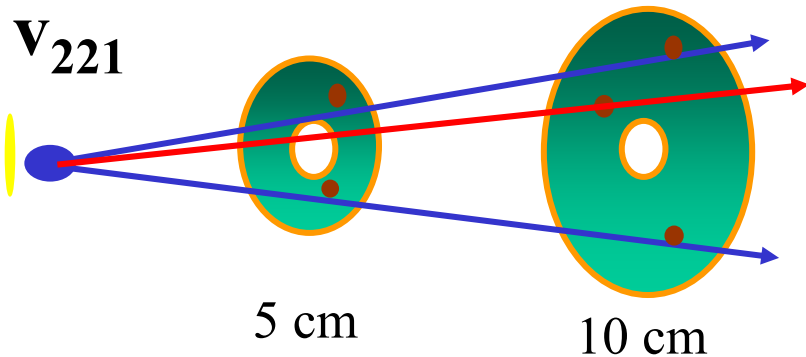
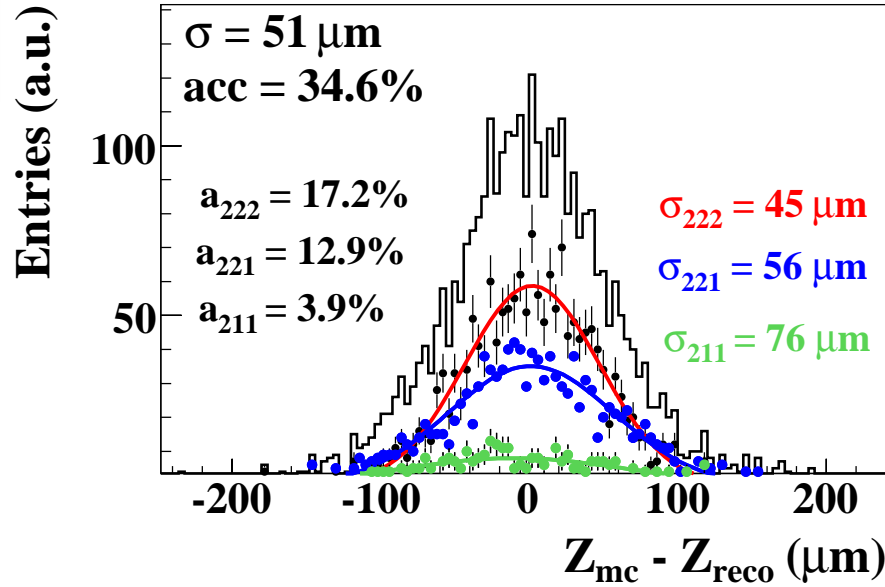
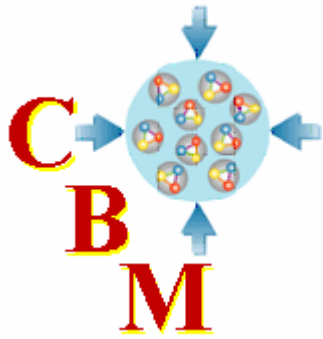


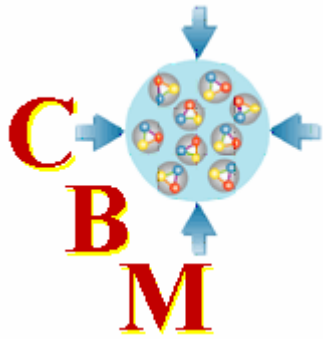
Entries (a.u.)



4.5 tracks central, 1 track mbias

Open charm z-vertex reconstruction





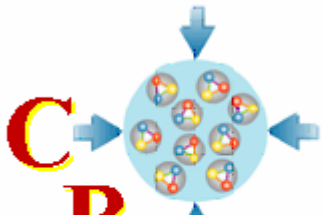
Strategy: background suppression keeping maximum of efficiency

single track parameters based cuts:

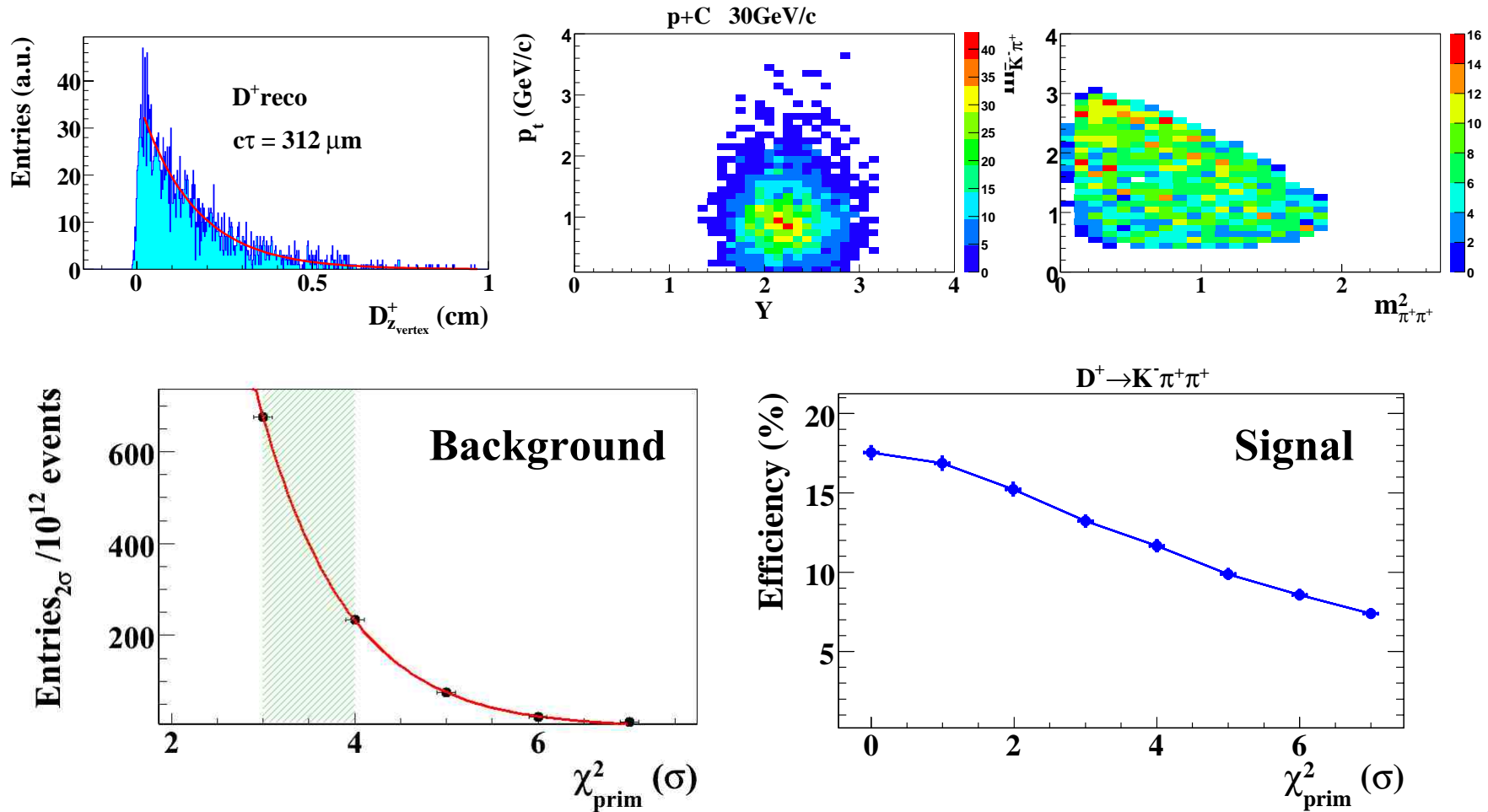
- ❖ χ^2_{prim} on the impact parameter value $3-4 \sigma$!
- ❖ **IP** impact parameter cut (upper value) 2 mm (safety)
- ❖ *track momentum cut* $p > 1.0 \text{ GeV}/c$
- ❖ *track transverse momentum* $p_t > 0$

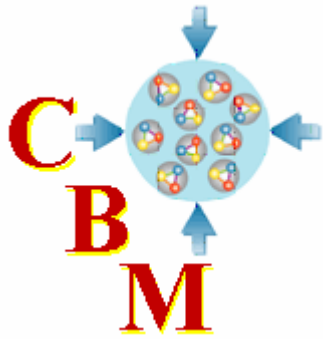
multiple track (particle) parameters based cuts:

- ❖ χ^2_{GEO} geometrical constrained fit 3.0σ ($z_v > 450 \mu\text{m}$)
- ❖ χ^2_{TOPO} topological constrained fit 3.0σ
- ❖ signal particle primary vertex $\text{DCA} < 30 \mu\text{m}$ (safety)



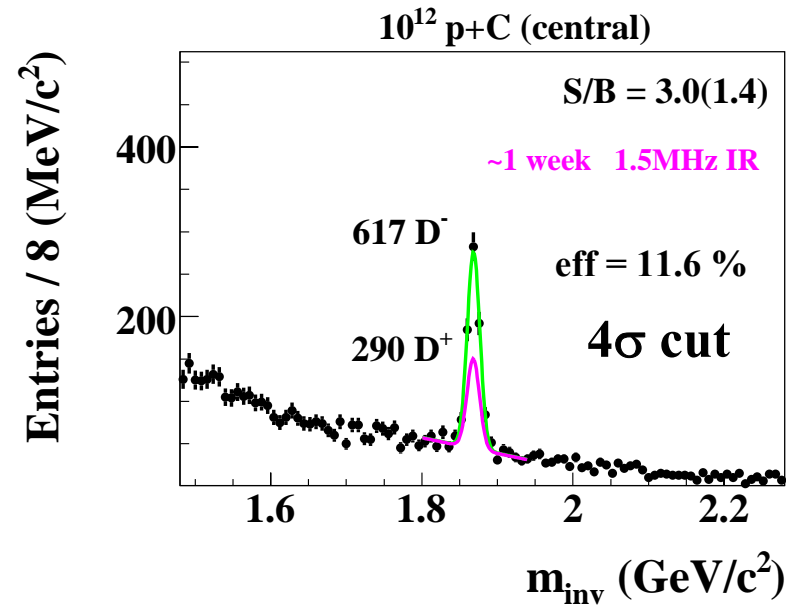
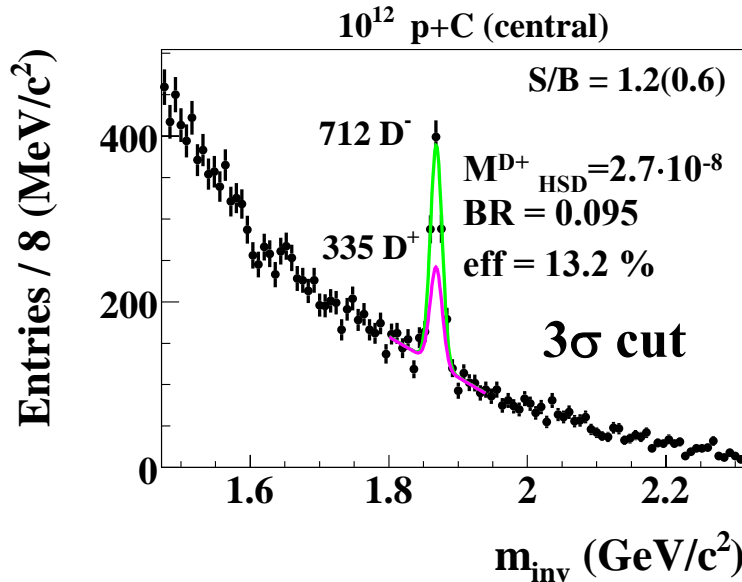
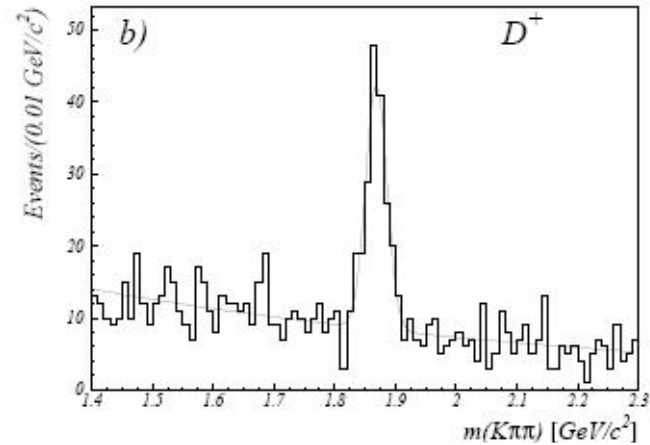
Strategy: background suppression keeping maximum of efficiency



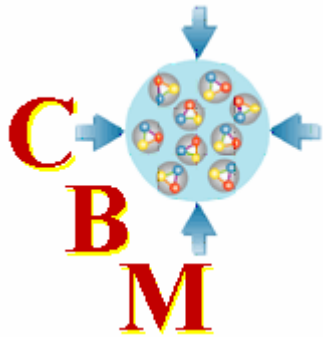


Invariant mass spectra

HERA-B p+A 920GeV
 2weeks @ 1.5MHz
 particles ID by RICH



with PV BG suppressed 10-30 times!



Summary

- CBM detector can collect $\sim 1\text{K}$ of D^\pm mesons per week at 1.5 MHz IR with p+C at SIS-100 energies.
- Developed Fast SIMDized CA tracking works fine, stable and could be used for on/off-line open charm event selection/analysis;
- CBM PV finder needs to be adjusted for low tracks multiplicity.

road map:

$D^0, \bar{D}^0, D_s^\pm, D^*$ reconstruction (new generator!);
 pile-up & clustering in the MAPS;
 Open charm trigger(?);
 Exotic particles: H-dibaryons reconstruction;