

NUCLEAR FRAGMENTS RECONSTRUCTION IN C-P REACTIONS IN THE SRC SETUP OF THE BM@N EXPERIMENT

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The Short-Range Correlation Experiment

1. 48 GeV/c carbon beam

2. Liquid hydrogen target

- Beam trigger BT = BC1 && BC2
- SRC1 trigger = IT && (X1 && Y1)
- SRC2 trigger = IT && (X2 && Y2)
- SRCT Full trigger =
- IT && ((X1 && Y1) || (X2 && Y2))
- SRCT2 Full trigger =
- IT && (X1 && Y1) && (X2 && Y2)

3. The goal of our research is

- Comparison with MC data
- Analysis of cross section of different fragments

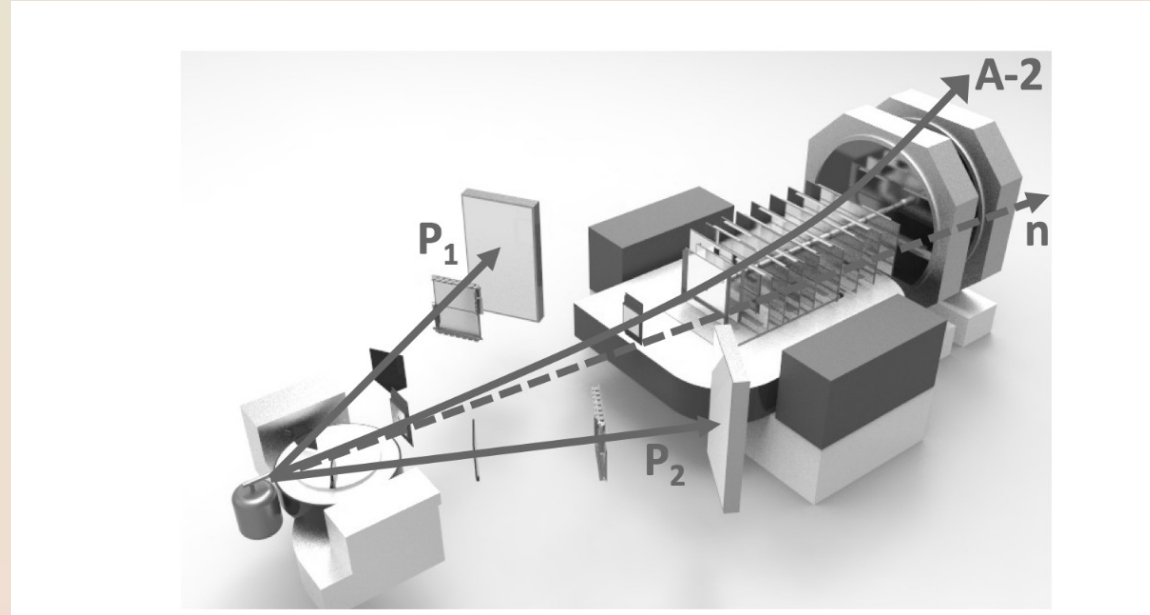


Fig.1 The SRC facility

The simulation and reconstruction procedure

The experiment

- Raw->Digits

Reconstruction

- Digits → Hits
- Hits → tracks

Monte Carlo data

Simulation:

- QGSM model
- Geant3 or Geant4 set points in a volume
- Points are transformed in the digit information (strip, layer, module, station, signal...)

Reconstruction:

- Digits → Hits
- Hits → tracks

Analysis and comparison

- *hits*
- *tracks*
- *vertex*
- *fragments*

The experimental data

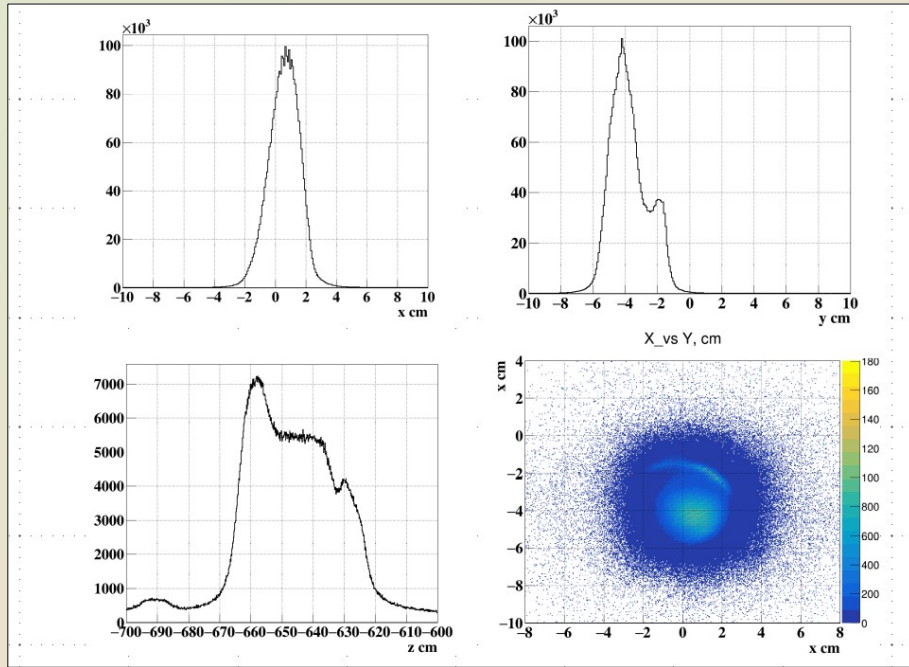


Fig: 2 The vertex reconstruction in the experimental data allows us to select the events with the reaction

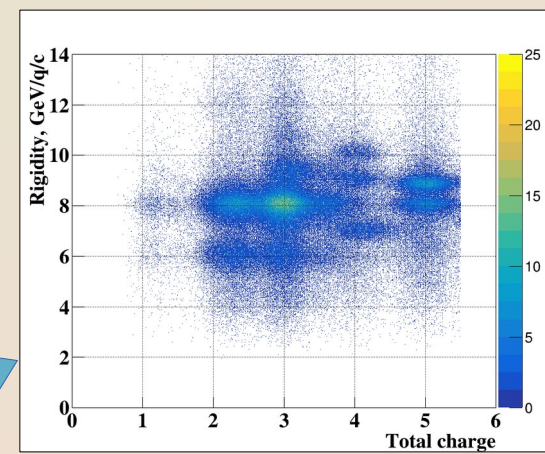
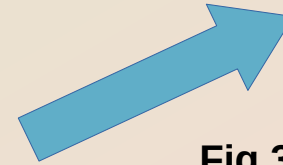


Fig.3 The fragments in the experiment

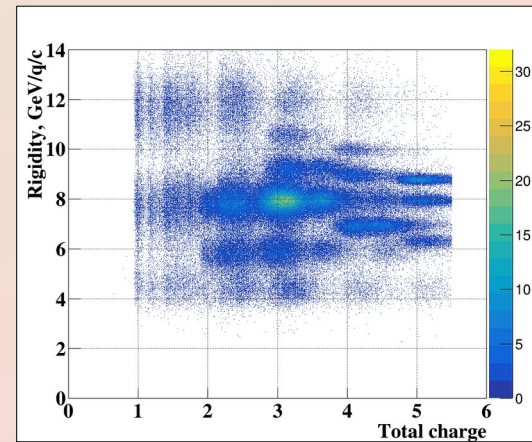


Fig.4 The fragments in the simulation

The efficiency of Gas Electron Multipliers

$$eff = \frac{N_i}{N_{all}}$$

- N_i – number of hits in station “i” for the events with more than 4 hits in the GEM track.
- N_{all}^i – all number of hits in station “i” for the events with more than 4 hits in the GEM track and the number when the station was missed for the events with 4 hits in the track.

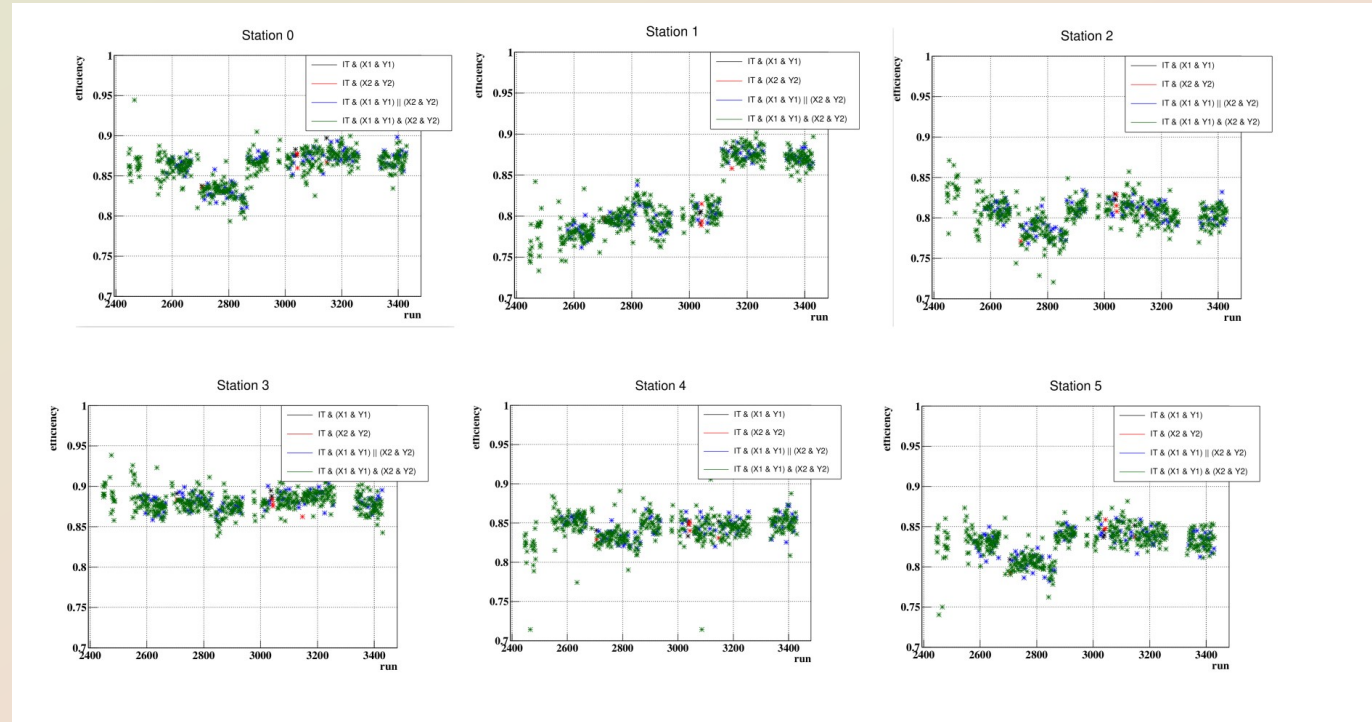
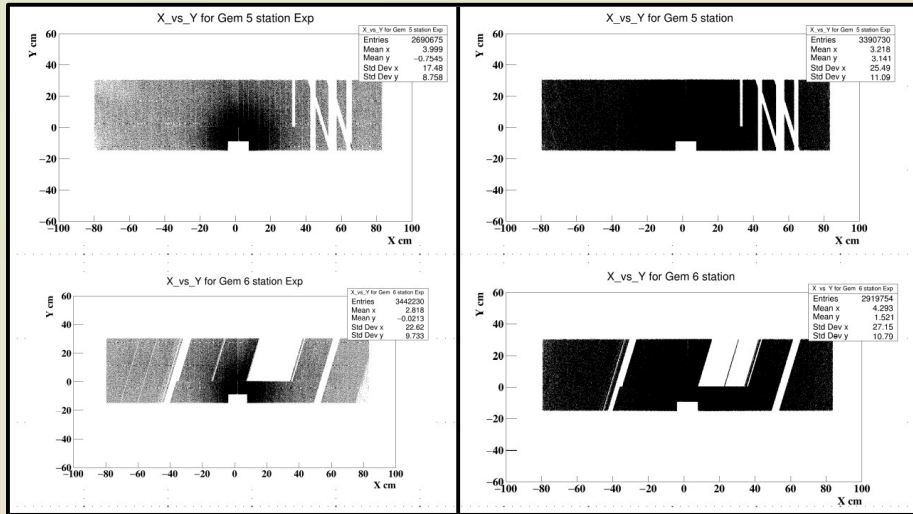


Fig.5 The efficiency during the experiment

The results of GEM efficiency

Experiment

Simulation



Some hits were missed

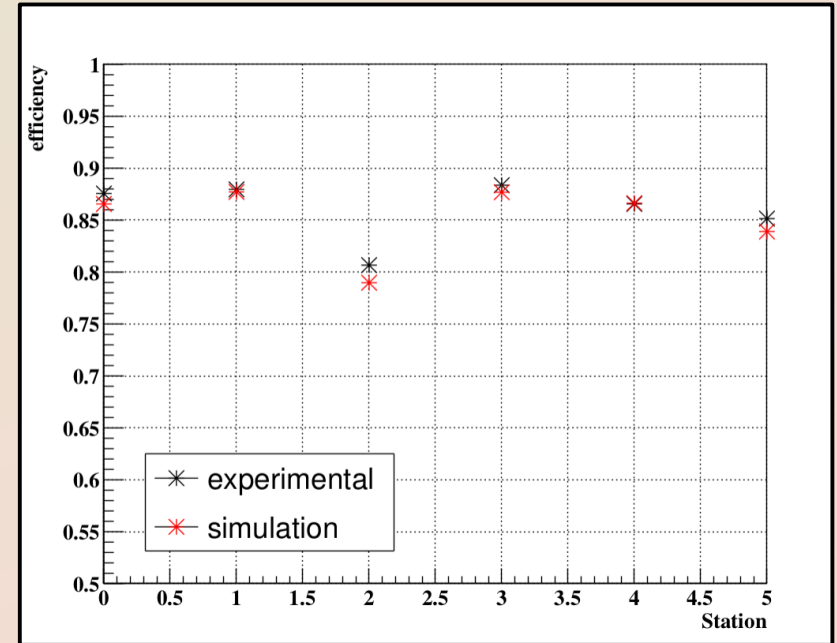
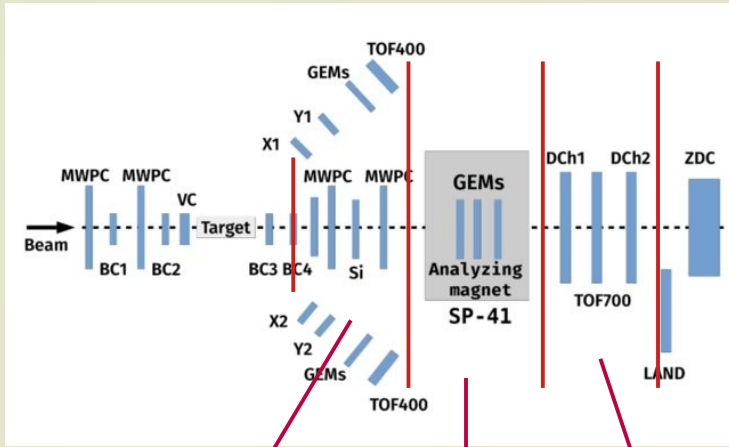


Fig: 6 The Gem station efficiency are close enough

The tracks matching efficiency



The global tracks are based on GEM tracks after residuals correction:

- *GEM +DCh -77.8% (MC)*
- *GEM +Ups - 40.7% (MC)*
- *Gem +Ups+DCh - 35.9%(MC)*

Upstream tracks

Gem tracks

DCh tracks

Global tracks

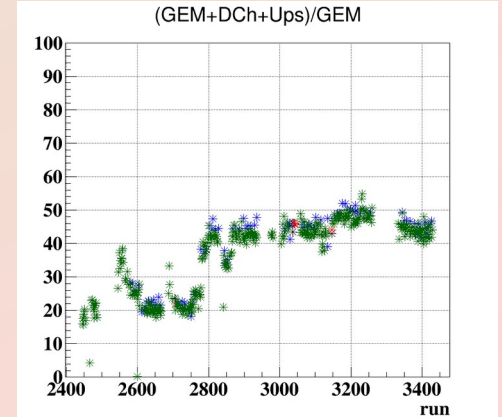
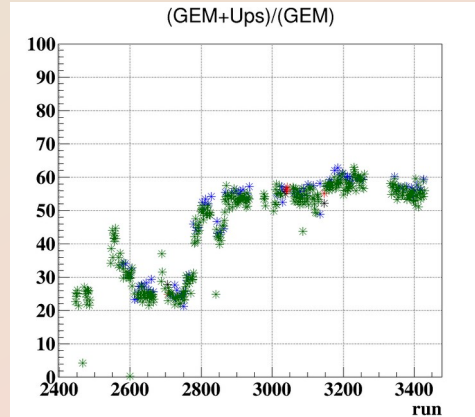
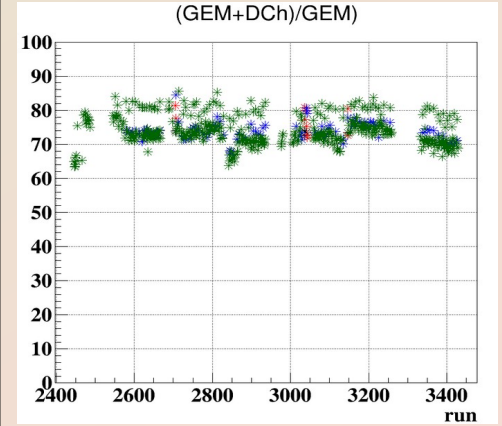


Fig. 7 The matching efficiency during the experiment

Summary

- 1. In the research we compared the information from Monte Carlo (MC) with the experimental data*
- 2. In the simulation chain beam counters were added. That allows us to distinguish the different fragments in MC.*
- 3. The work of GEM detectors in simulation was modified according to the information from the experiment. We added “dead” strips and the efficiency of GEM stations is close enough now for the experiment and MC.*
- 4. The tracks matching efficiency of subsystems were studied and some problems with upstream tracks were revealed.*

Plans:

- 1. To correct distributions of residuals in GEM stations.*
- 2. To begin physical analysis of the data obtained.*