HYPERONS AT BM@N EXPERIMENT: FIRST RESULTS

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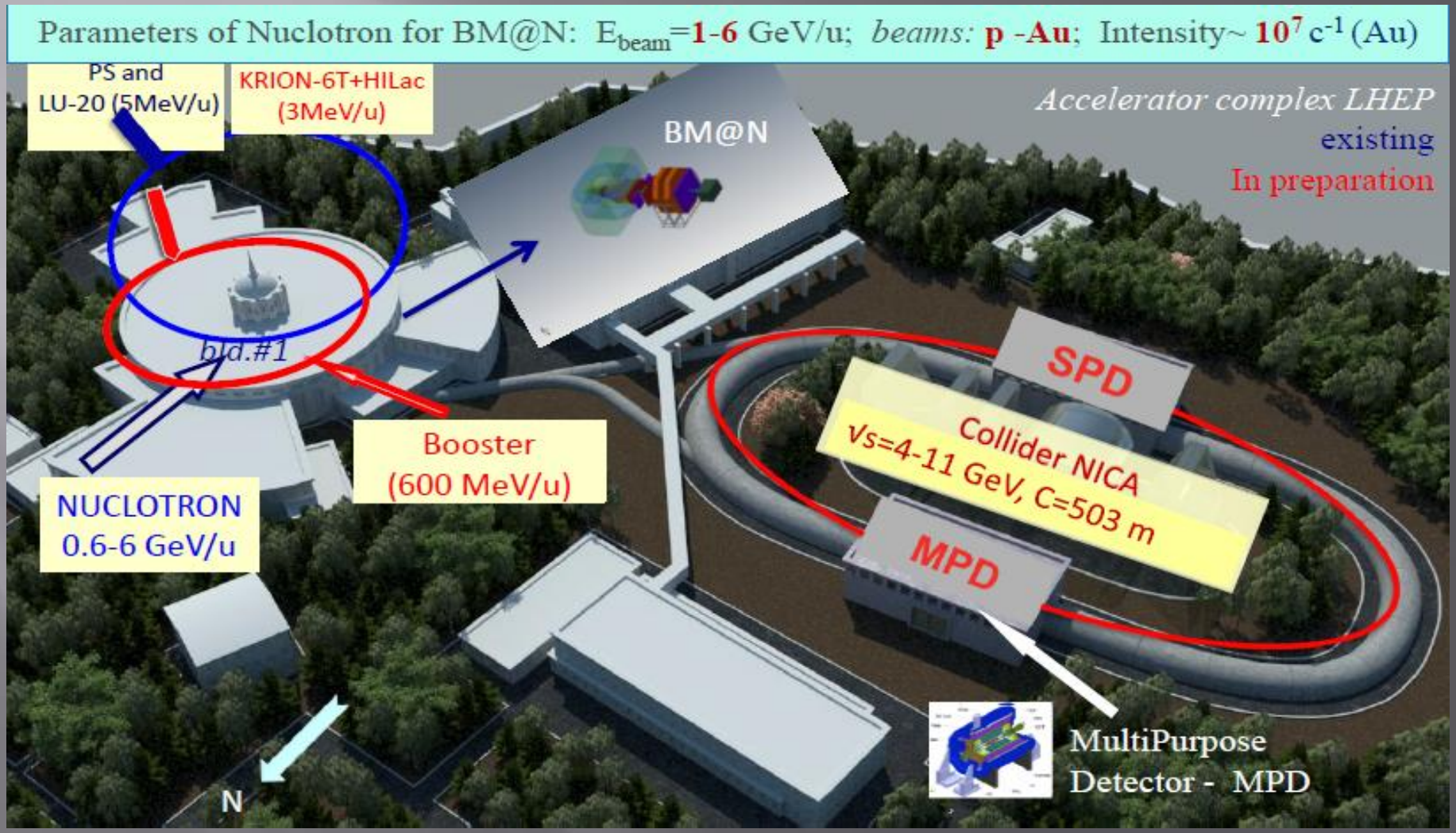
Outline

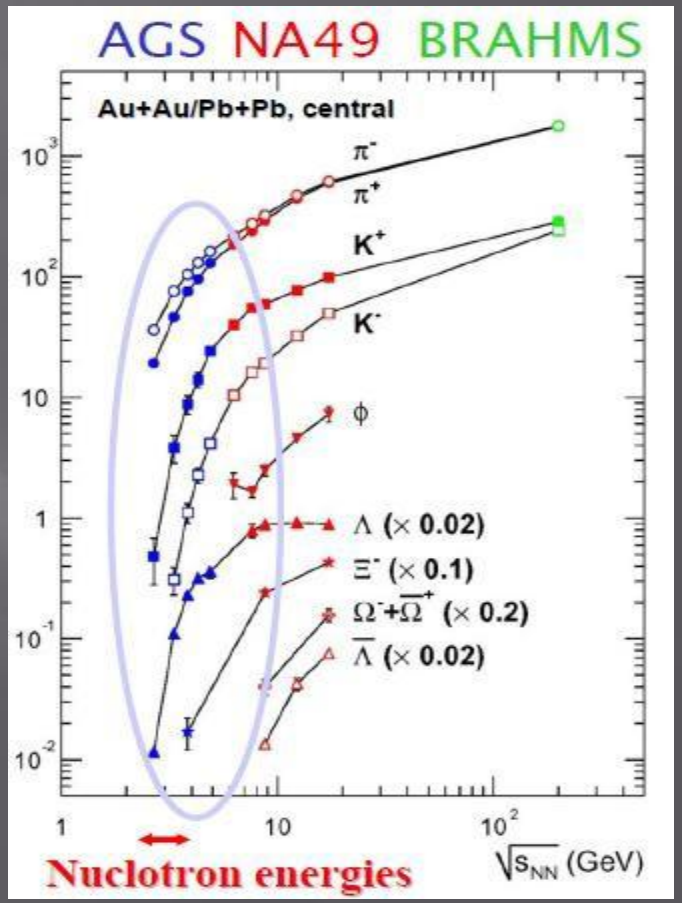
- NICA complex & BM@N experiment
- Technical run with C beam (March 2017)
  - BM@N detector set-up
  - Λ & Ks0 reconstruction
  - Exp. Vs MC
- Run with Ar & Kr beams (March 2018)
  - BM@N detector set-up
  - PV & Λ reconstruction
- Summary & Plans

NICA complex



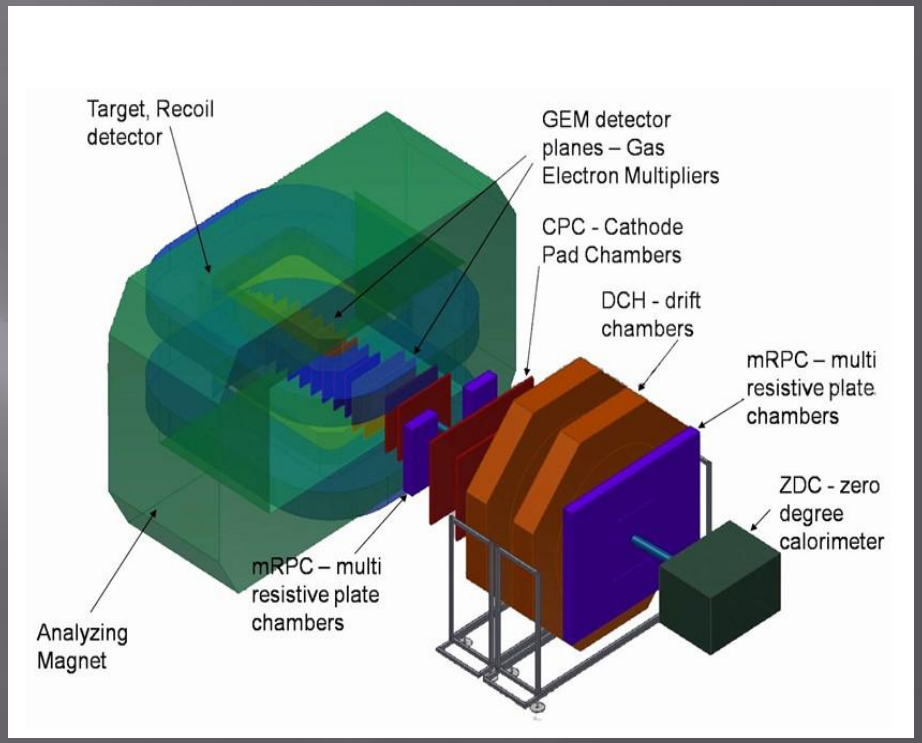
BM@N: physical possibilities

- Investigation the equation-of-state (EOS) of dense nuclear matter
- Studying of production of light hypernuclei(HIC)
- Studying strangeness at threshold (A+A)

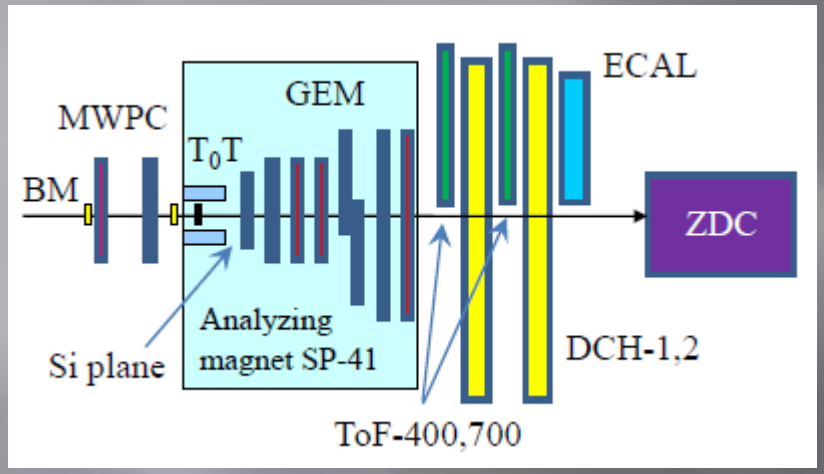


Detector

- Central tracker GEM+Si to reconstruct AA interactions
- Outer tracker DCH & CSC to link central tracks to ToF system
- ToF system to identify hadrons and light nucleus
- ZDC to measure centrality of AA collisions and form trigger
- Electromagnetic calorimeter for γ, e+e- measurement



Technical run 2017

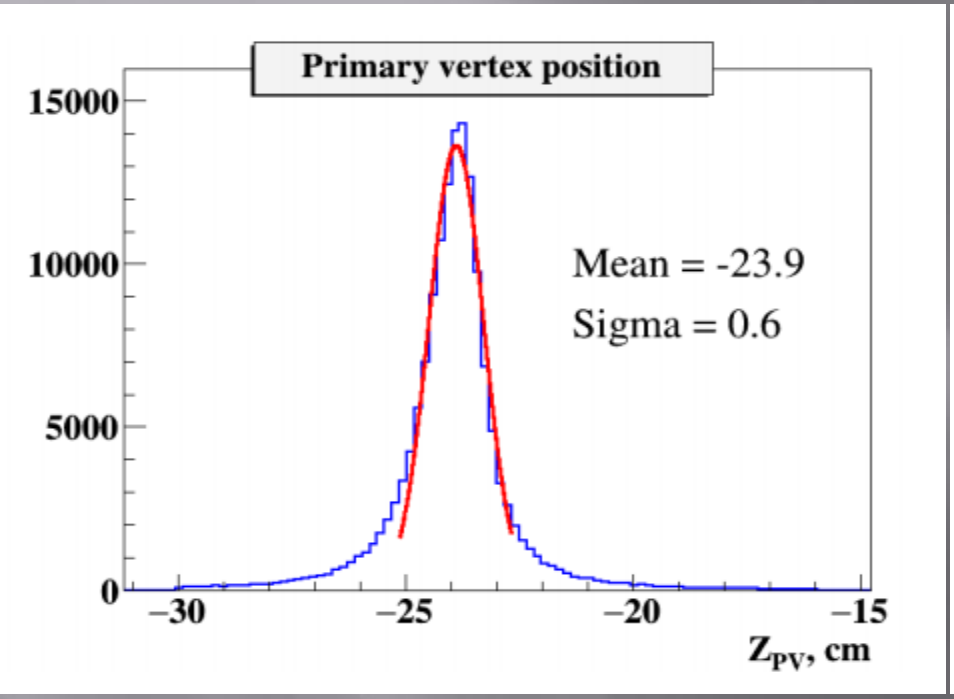


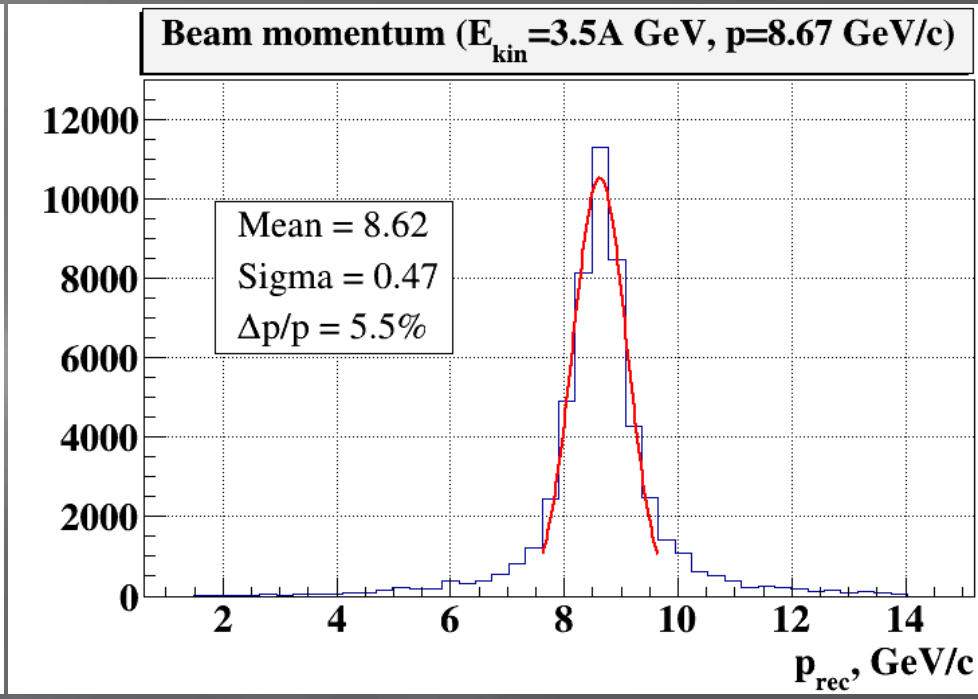
Carbon beam: 3.5, 4.0, 4.5 A GeV

5 GEM detectors 66 cm x 41cm
2 GEM detectors 163 cm x 45 cm
1 plane of Si detector for tracking (2-coordinate Si detector X-X′(±2.5°) with strip pitch of 95/103 μm, full size of 25 cm x 25 cm)

Tasks:
- Registration of inelastic interactions in coordinate detectors
- Measure beam momentum in magnetic field of 0.6 T

Primary Vertex & Beam momentum

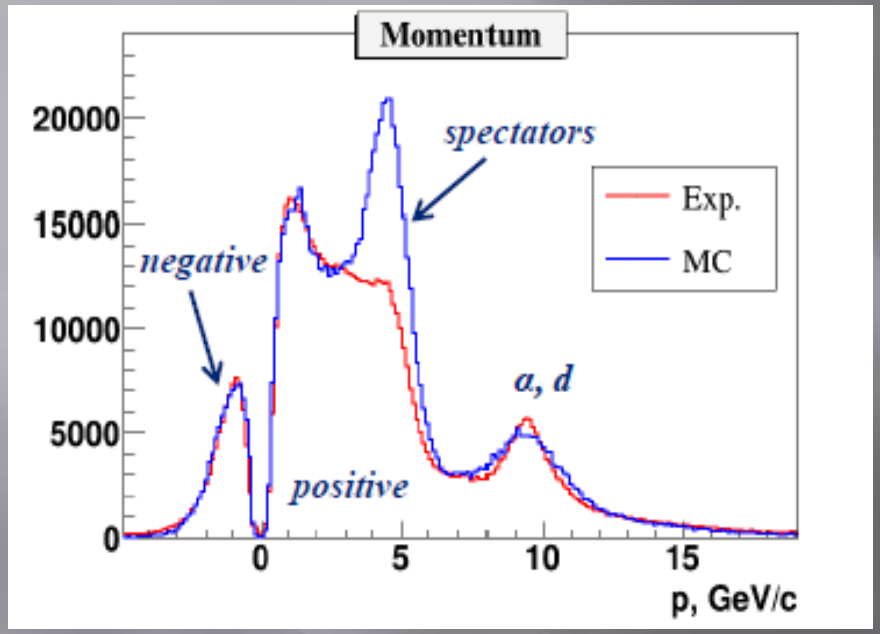


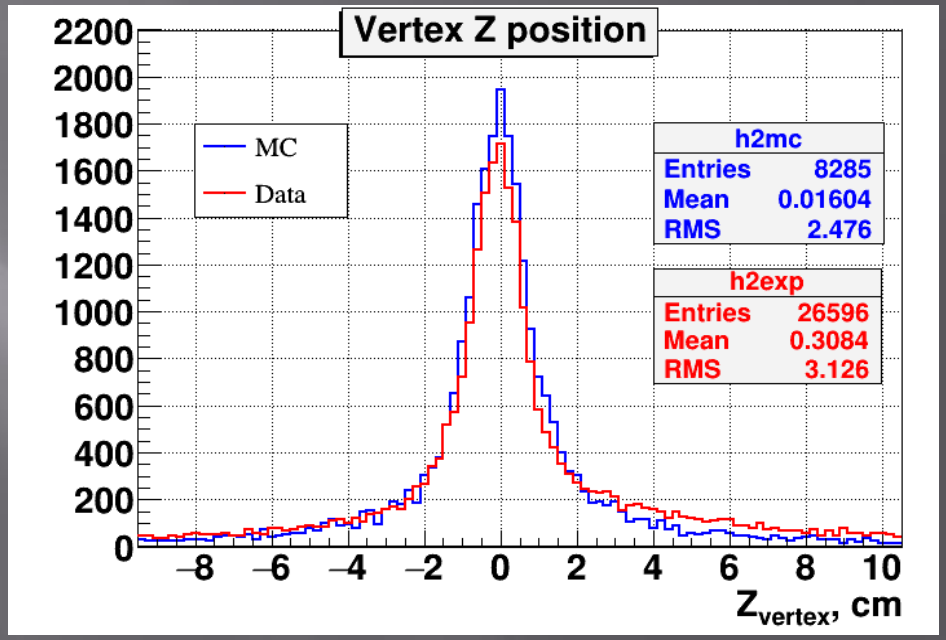


To improve vertex and momentum resolution :

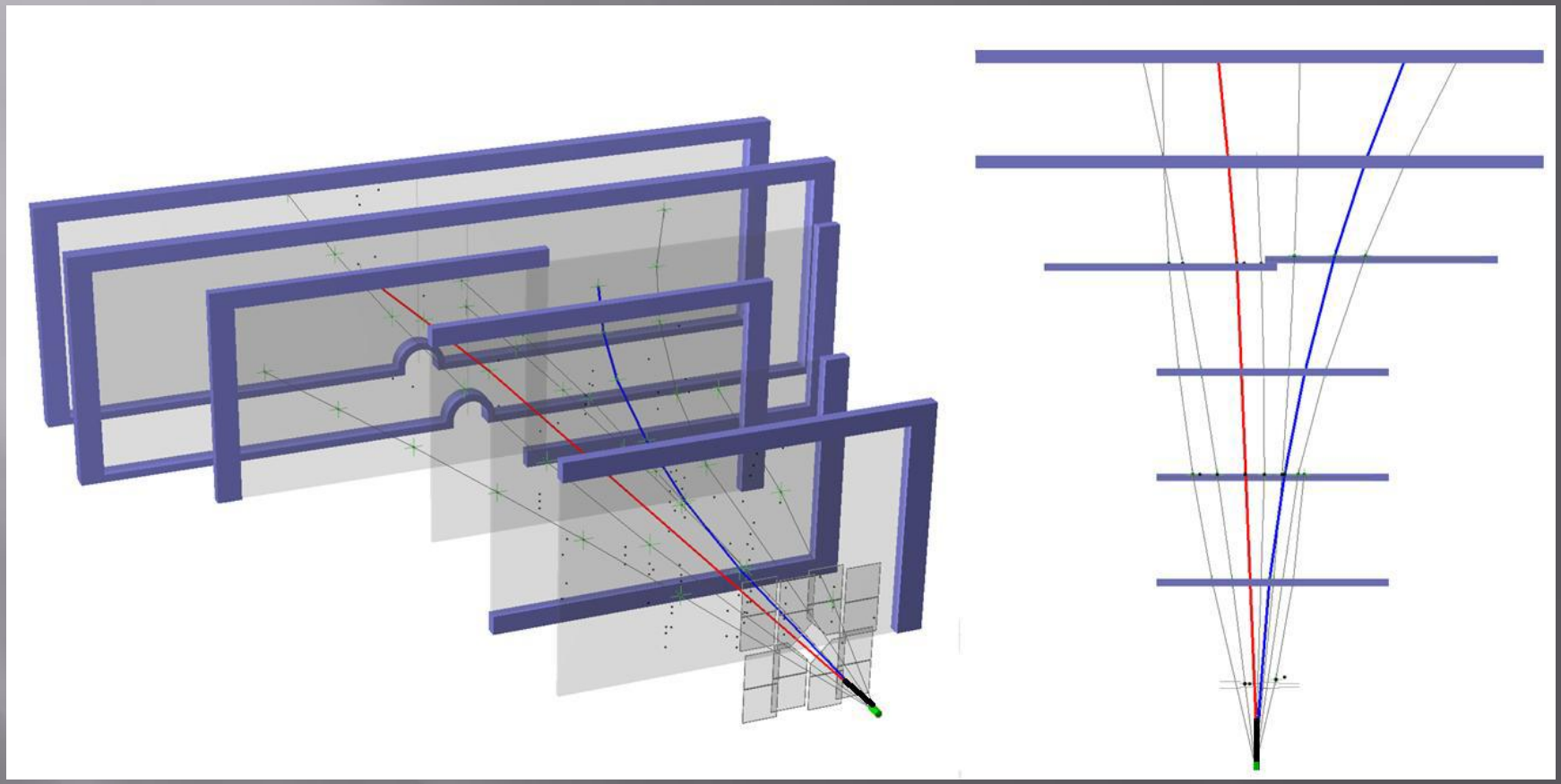
- Need few planes of forward Silicon detectors
- Need more GEM planes to improve track momentum reconstruction

Momentum & PV (Exp. vsQGSM MC)





Visualization of Λ decay

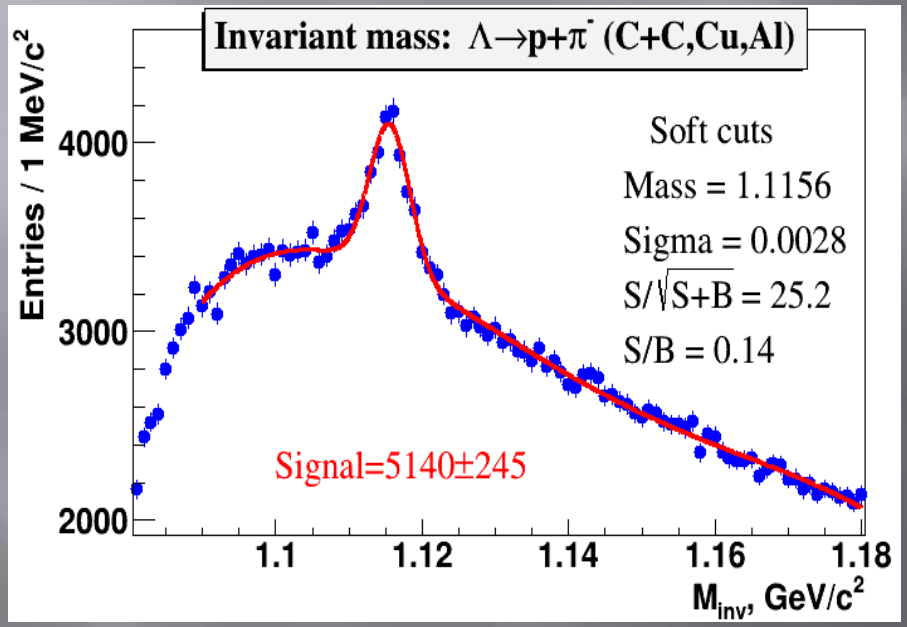


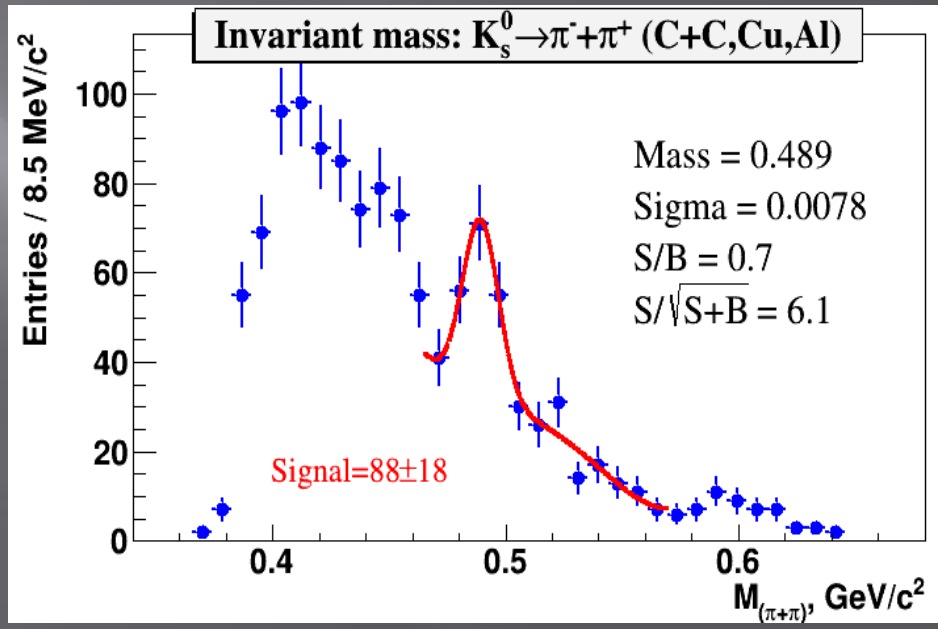
Event Display: Example of the Λ decay reconstruction in the tracker (GEM + Si) in C+C interaction

Λ & K°s reconstruction in carbon run

Ekin= 4.0A GeV, No PID, only GEM+Si

Methodical Paper published in PEPAN Letters, v.15, p.136, 2018(2)





Monte Carlo simulation showed that only ~**4% of Λ and ~0.8% of** K°s **could be reconstructed.**

BM@N set-up in March 2018

Ar beam: 3.2A GeV

Kr beam: 2.4 (3.0)A GeV

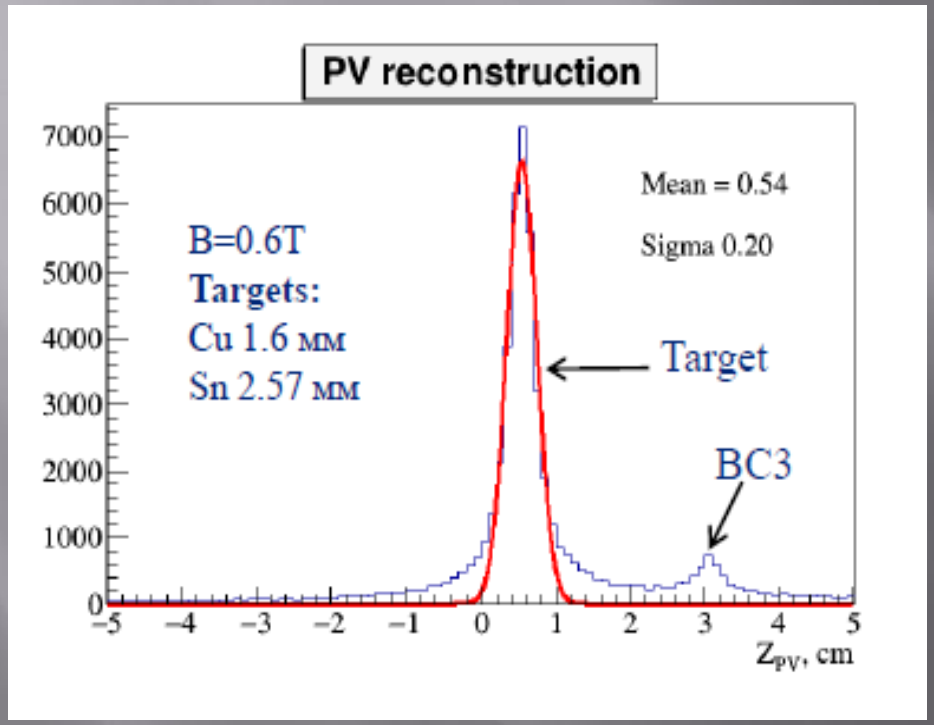
6 GEM detectors 163 cm x 45 cm

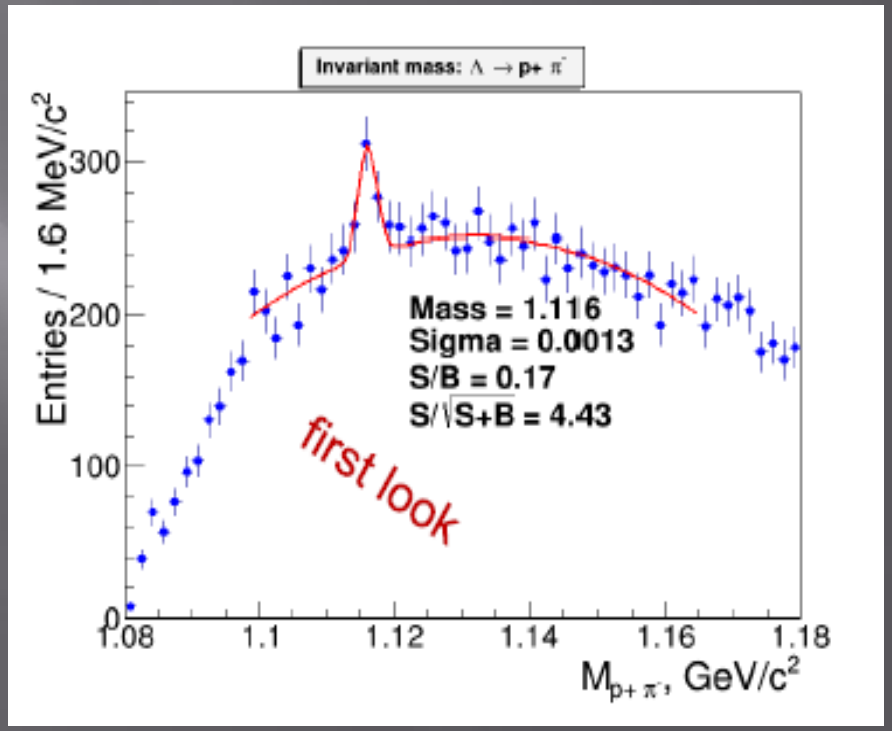
forward Si strip detectors for tracking

Tasks:

- Hyperon production measured in central tracker (Si + GEM)
- Charged particles and nuclear fragments identified with ToF
- Gamma and multi-gamma states identified in ECAL

Λ & PV reconstruction in argon run





Summary & Plans

- BM@N experiment has recorded experimental data with carbon, argon and krypton beams at several energies and on several targets.
- Minimum bias interactions were analyzed with the aim to reconstruct tracks, primary and secondary vertexes using central GEM and Si tracking detectors.
- Signals of Λ-hyperon and Ks0 are reconstructed in proton-pion and pion-pion invariant mass spectra.
- Work is ongoing to tune MC simulation for carbon beam to describe the data and extract detector efficiencies in order to obtain Λ-hyperon yields.
- For better results in Ar(Kr) run we have to improve track finding algorithm.