Drift Chambers Detector in the SRC setup at BM@N

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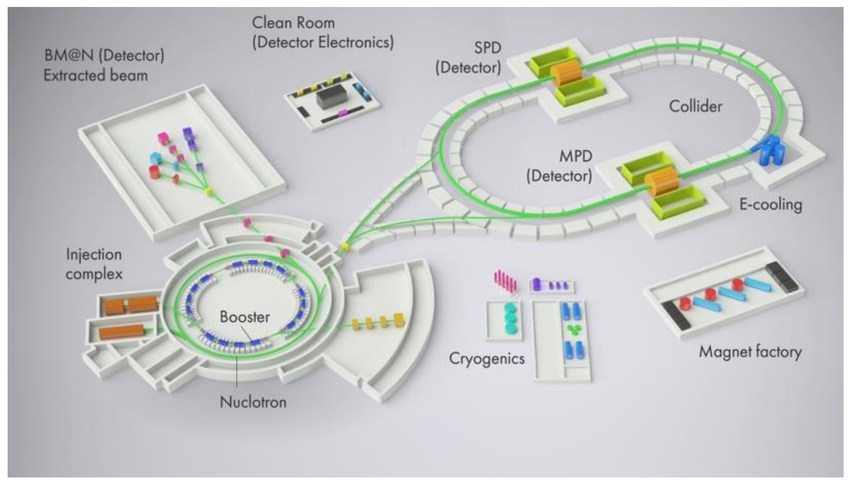
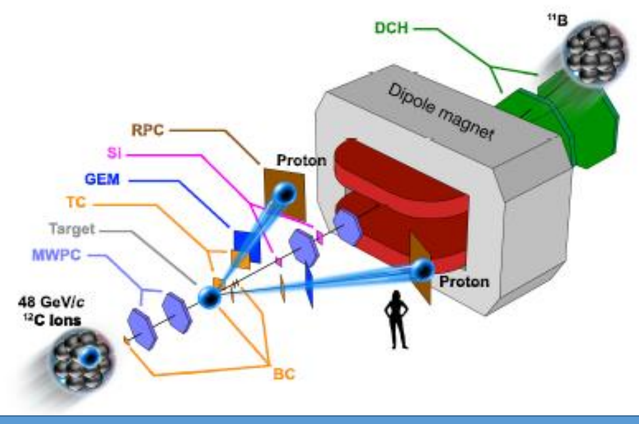
SRC @ BM@N

The Baryonic Matter at Nuclotron (BM@N) is the first step of the realization of the Nuclotron-based Ion Collider fAcility (NICA) mega-science project. It is meant to be a precise tool for the study of strange hyperon and hyper-nuclei production yields and ratios [1].



A substantial part of the nucleons in the nucleus belongs to strongly interacting short-lived pairs, called SRC-pairs. The nucleons in these pairs have a high absolute and low momentum of the center of mass (relative to the Fermi momentum). Traditionally, the properties of SRC pairs are studied using hard scattering reactions when the nucleus interacts with one nucleon. In the BM@N experiment, inverse kinematics were used: the carbon nucleus hits a fixed target [2]. This program involves the use of light carbon ions and a unique liquid hydrogen target.

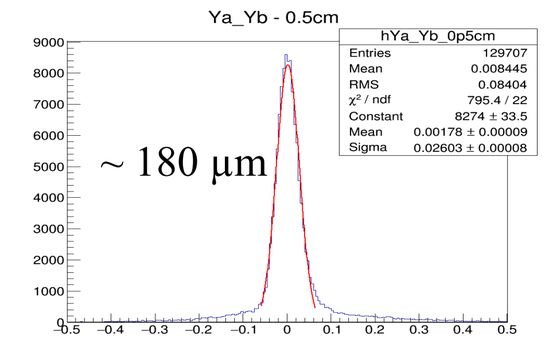
$$^{12}C + p \rightarrow 2p + {}^{10}B / {}^{10}Be + (n / p)$$



Drift Chambers

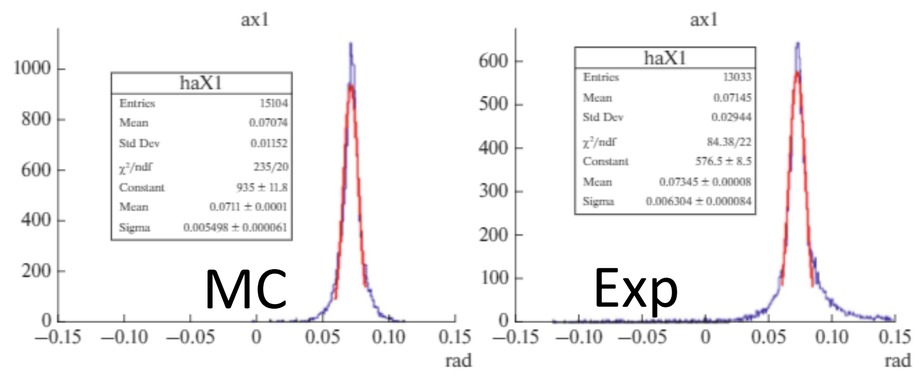
The detectors were brought from NA48 [3] experiment:

- 4 double coordinate planes;
- wire angles 0,90,±45°,
- wire pitch 10 mm,
- Rmin = 10 cm,
- 2048 wires per chamber,
- Yout ± 1.35 m, Xout ± 1.35 m.



Average DCH spatial resolution.

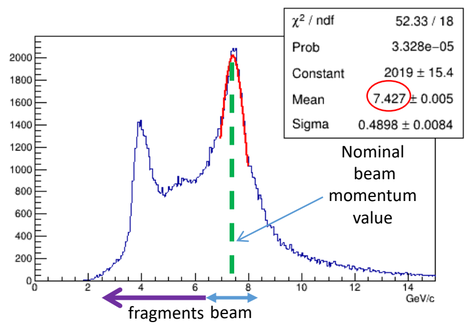
Simulated vs. Experimental Data



Trajectory slope in DCH for Simulated and experimental data

Full correspondence of the reconstruction of the simulated and experimental data achieved [4].

Particles momentum estimation via DCH



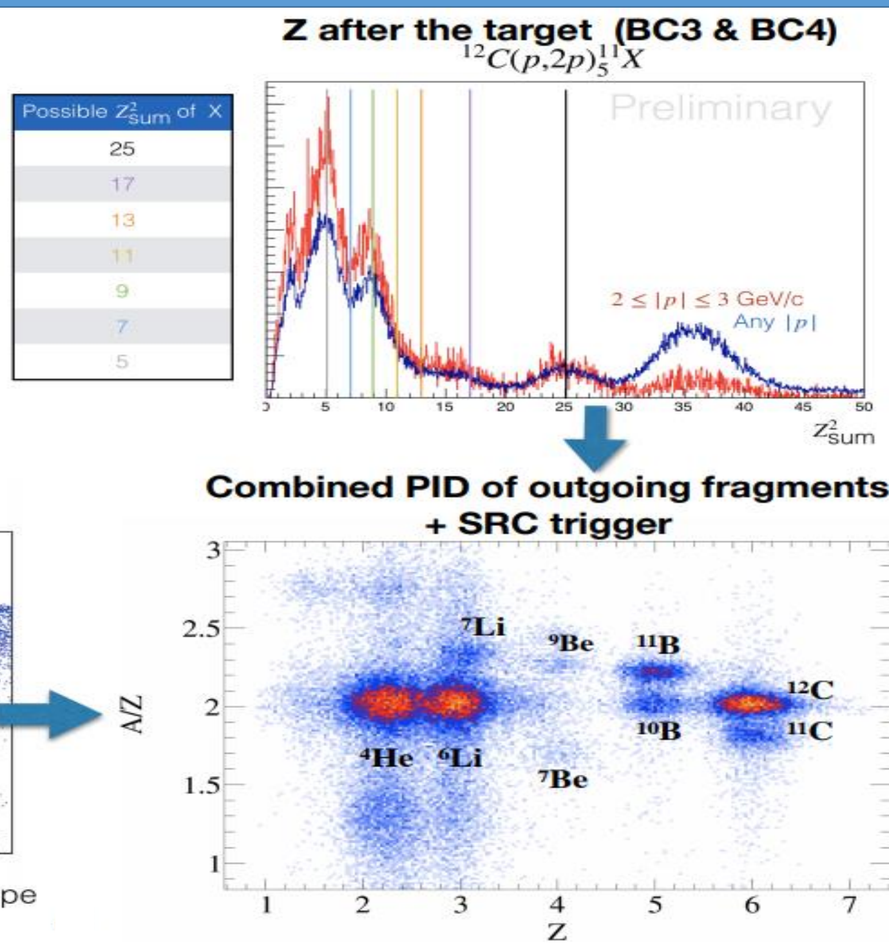
Estimated momentum for registered particles in DCH

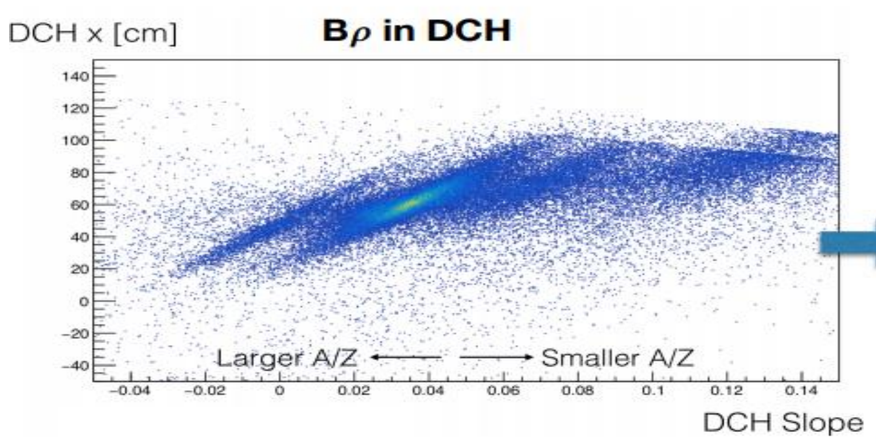
Nominal beam momentum value given by the accelerator is **7.46 GeV/c**. The estimated beam momentum from reconstructed data is **7.43 GeV/c**.

The momentum resolution for the working field value is **3.2%.**

PID using charges from beam counters and tracks from DCH

High quality reconstruction of the track parameters in DCH made it possible to identify the final state ions and select events with quasi-elastic nucleon knockout from the carbon nucleus, as well as select events in which a nucleon was knocked out from the SRC pair for further analysis.





References

1. M. Kapishin, Eur. Phys. J. A52, 213--219 (2016)
2. BM@N Collaboration, "*Unperturbed inverse kinematics nucleon knockout measurements with a 48 GeV/c carbon beam*", Nature Physics, 17, 693–699, (2021)
3. G.D. Barr et all, CERN/SPSC/90-22/P253
4. V.Palichik, N. Voytishin. "*Reconstruction of Simulated and Experimental Data in the Drift Chambers of the BM@N Experiment"*, Phys. Part. Nuclei Lett. **19**, 501–504 (2022)

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