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## Demonstrating CBM Capabilities through $\Lambda$ Baryon Reconstruction in Ni+Ni Collisions with the mCBM Experiment at SIS18 of GSI/FAIR

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The Compressed Baryonic Matter (CBM) experiment at the upcoming Facility for Antiproton and Ion Research (FAIR) is a high-rate fixed-target experiment designed to investigate nuclear matter at extreme baryon densities in relativistic nucleus-nucleus collisions. To enable high-statistics measurements of rare probes, CBM is designed to operate at event rates up to 10 MHz. This necessitates the development of fast and radiation-tolerant detectors, self-triggered front-end electronics, a free-streaming data acquisition architecture, and real-time event reconstruction capabilities. Prototype versions and pre-series productions of the CBM detector systems have been deployed in the mini-CBM demonstrator setup mCBM —an experimental precursor comprising sub-components of all major CBM systems, installed at the SIS18 facility of GSI/FAIR within the FAIR Phase-0 program.

In 2024, Ni<sup>+</sup>Ni<sup>-</sup> collisions at a kinetic beam energy of 1.93 AGeV and an average interaction rate of about 500 kHz were successfully recorded. This dataset enables a detailed evaluation of the operational performance of the detector systems as well as the complete CBM data chain, while the reconstruction of rare  $\Lambda$  baryons serves as a natural benchmark. This paper presents the first results on  $\Lambda$  baryon reconstruction with the mCBM experiment, demonstrating the readiness of the detector technologies and the data chain for the upcoming full-scale CBM experiment.

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