

The CBM Time-of-Flight system

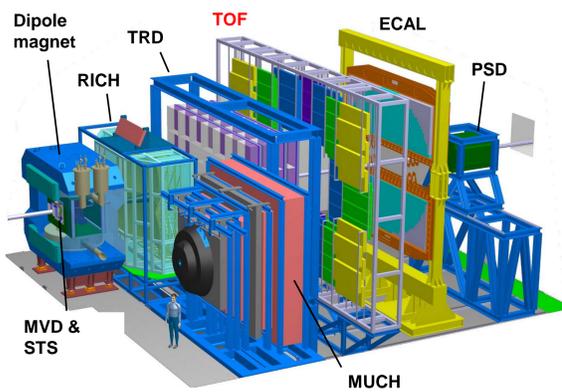
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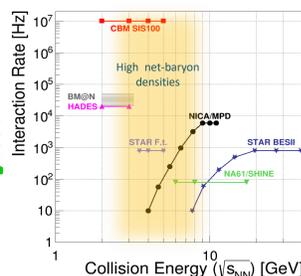
Compressed Baryonic Matter experiment at FAIR

- Exploring the QCD phase diagram at large baryon densities
- Charged hadron PID for HI-collisions at kinetic beam energies $T_{\text{beam}} = 2 - 11$ AGeV (for the heaviest system)
- High granularity and rate capability for interaction rate $R \leq 10$ MHz
- Multi-gap Resistive Plate Chamber (MRPC) system with about 100000 timing channels and a system time resolution of $\sigma \leq 80$ ps
- Usage in STAR BESII campaign as part of the FAIR phase 0 program as eTOF system with acceptance range $1.0 \leq \eta \leq 1.5$

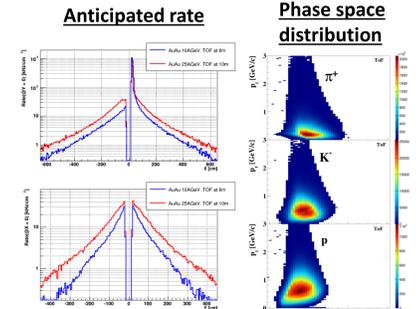
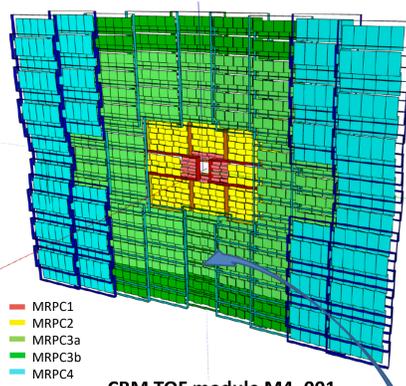
The Compressed Baryonic Matter (CBM) experiment



Tracking acceptance: $2^\circ < \theta_{\text{lab}} < 25^\circ$
 Free streaming DAQ
 Software based event selection
 $R_{\text{int}} = 10$ MHz (Au + Au)



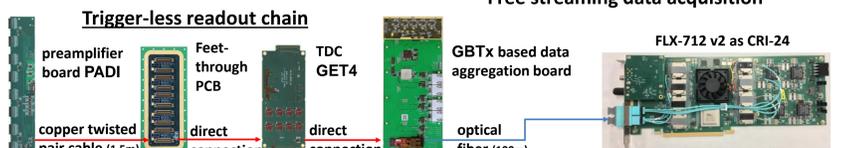
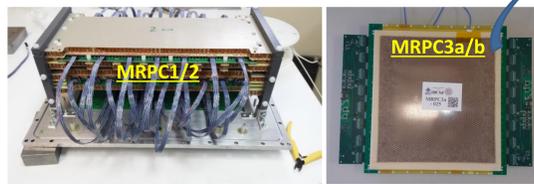
The CBM Time-of-Flight wall



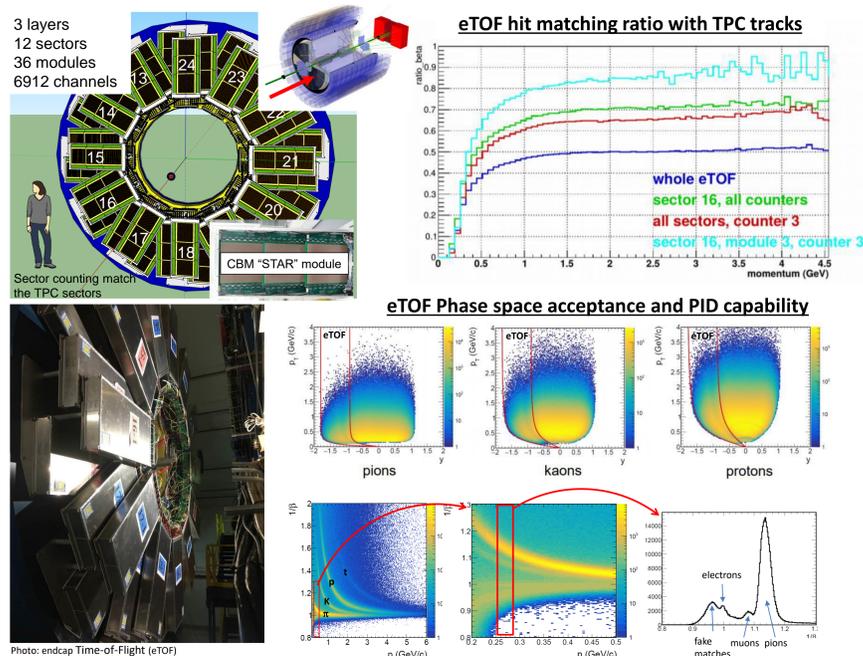
- CBM-ToF Requirements**
- Full system time resolution $\sigma_T \sim 80$ ps
 - Efficiency $> 95\%$
 - Rate capability ≤ 30 kHz/cm²
 - Polar angular range $2.5^\circ - 25^\circ$
 - Active area of 120 m²
 - Occupancy $< 5\%$
 - Low power electronics
 - (~100.000 channels)
 - Free streaming data acquisition

CBM MRPC prototypes

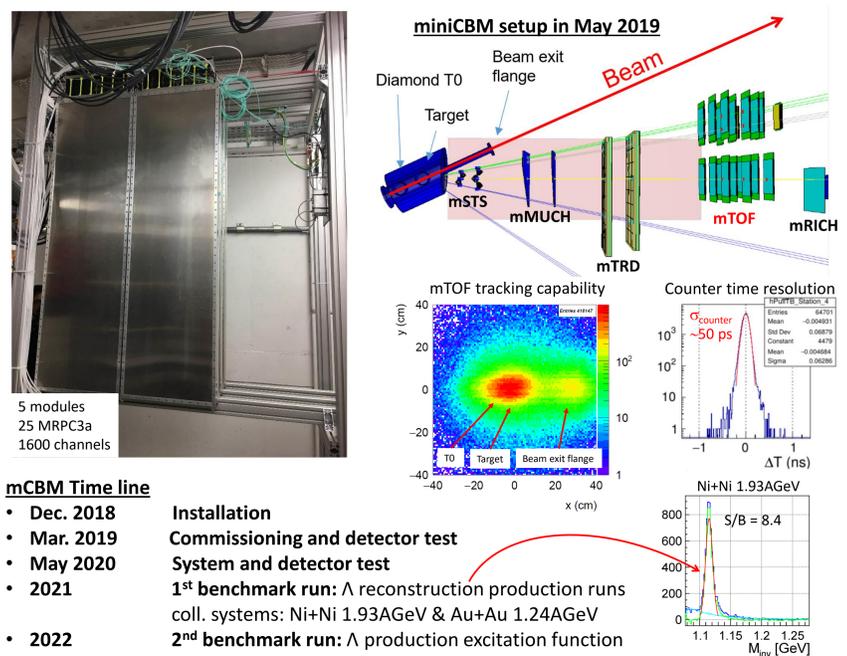
- Counter properties**
- Active area 300 – 864 cm²
 - Granularities 10 – 27 cm²
 - Low resistive glass
 - Rate capability > 30 kHz/cm²
 - Time resolution about 50 ps
 - Efficiencies above 95 %
 - Cluster size about 1.4 - 2



FAIR phase 0 program: eTOF upgrade at STAR/BNL



FAIR phase 0 program: mTOF at mCBM/GSI



Summary: The CBM Time-of-Flight system is developed by 8 institutions from China, Germany, Romania and Russia. It comprises about 100000 channels and a rate capability up to 30 kHz/cm². The targeted system time resolution is 80 ps at an efficiency above 95%. Test beam experiments have demonstrated counter resolutions in the order of 50 ps. CBM-TOF will participate as part of the FAIR phase 0 program in the BESII campaign of STAR@RHIC and miniCBM@GSI. The CBM-TOF wall will be ready to take beam at FAIR in 2024.

