

# Emissivity of Baryon-Rich Matter – Dilepton Spectroscopy in CBM

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for the CBM collaboration

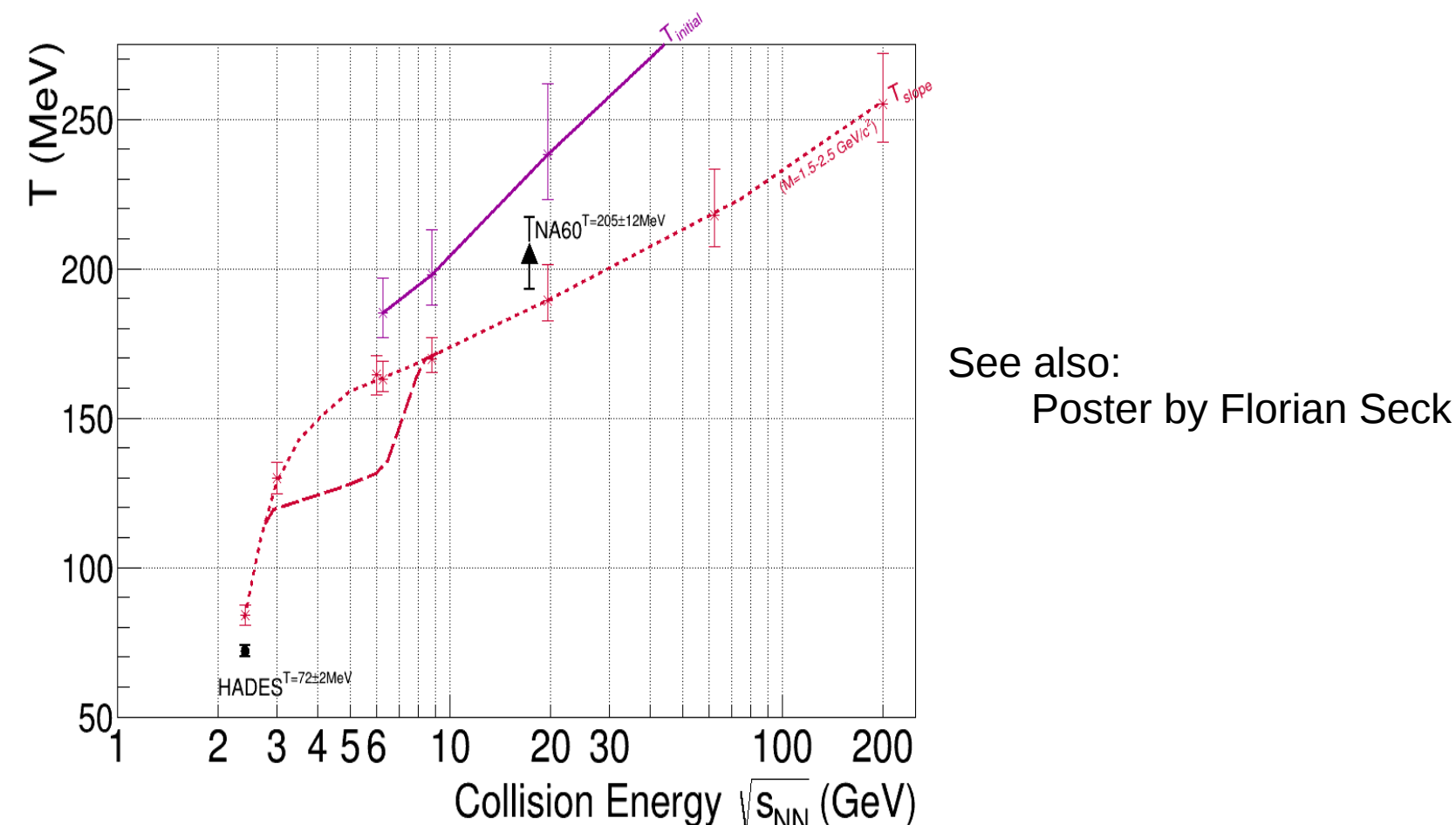
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## Motivation

Explore QCD phase structure

Phase transition(s) and critical point  
- Measure caloric curve for the hadron-QGP phase

Chiral Symmetry restoration  
- Measure in-medium  $\rho$  spectral function ( $\rho - a_1$  chiral mixing)



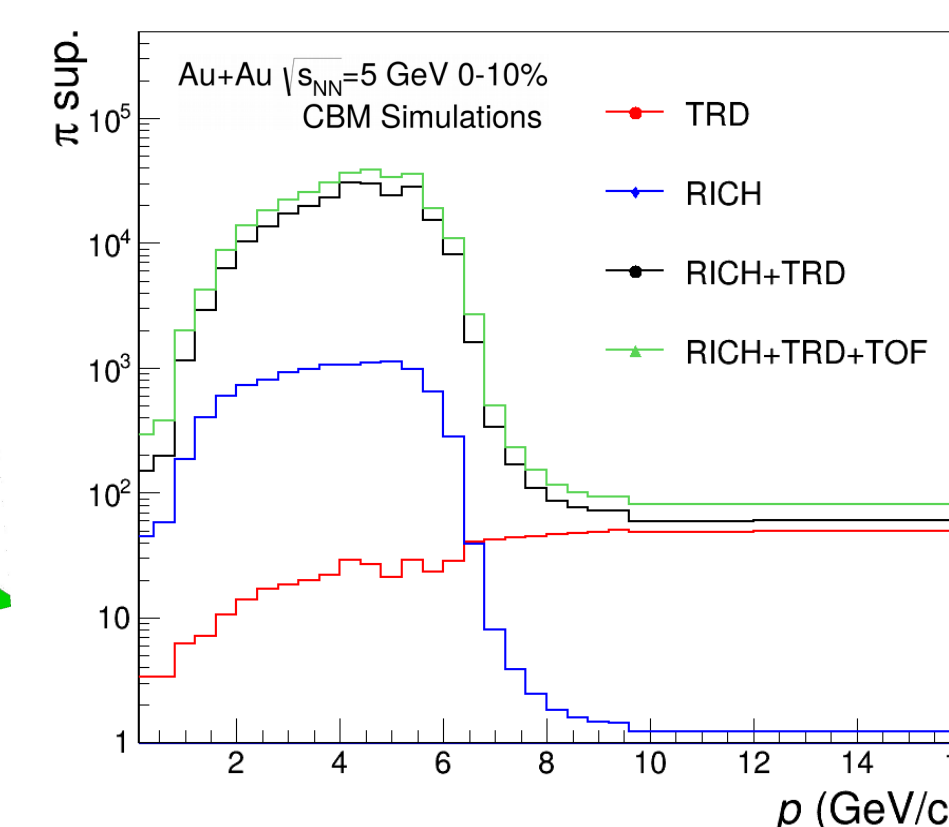
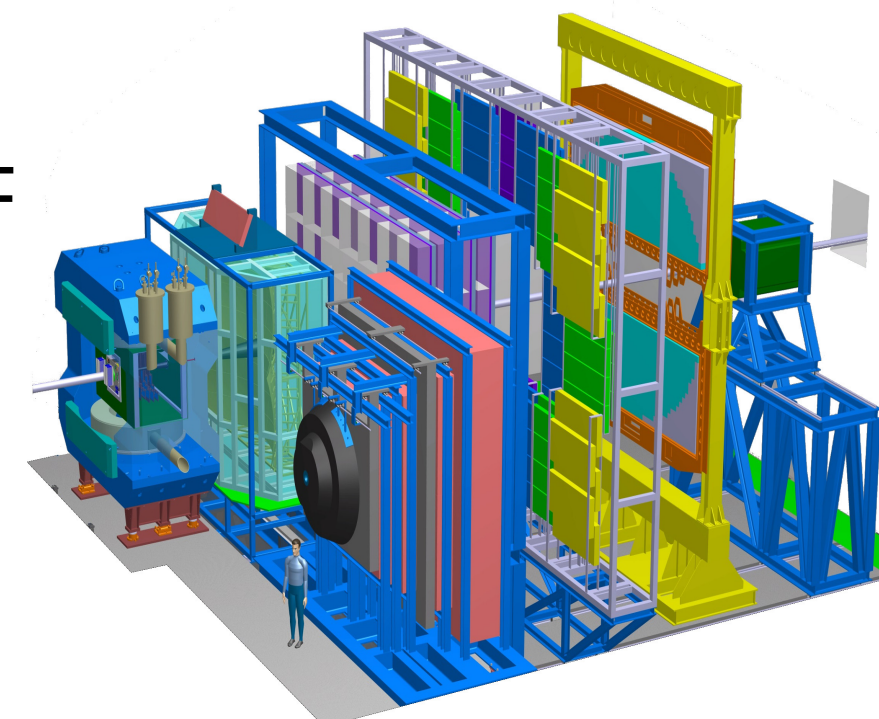
## Electron identification

Particle tracking:

- STS (in dipole magnet) + TRD + TOF

Particle identification (PID):

- RICH → Artificial Neural Network  
- TRD → Likelihood methods  
- TOF

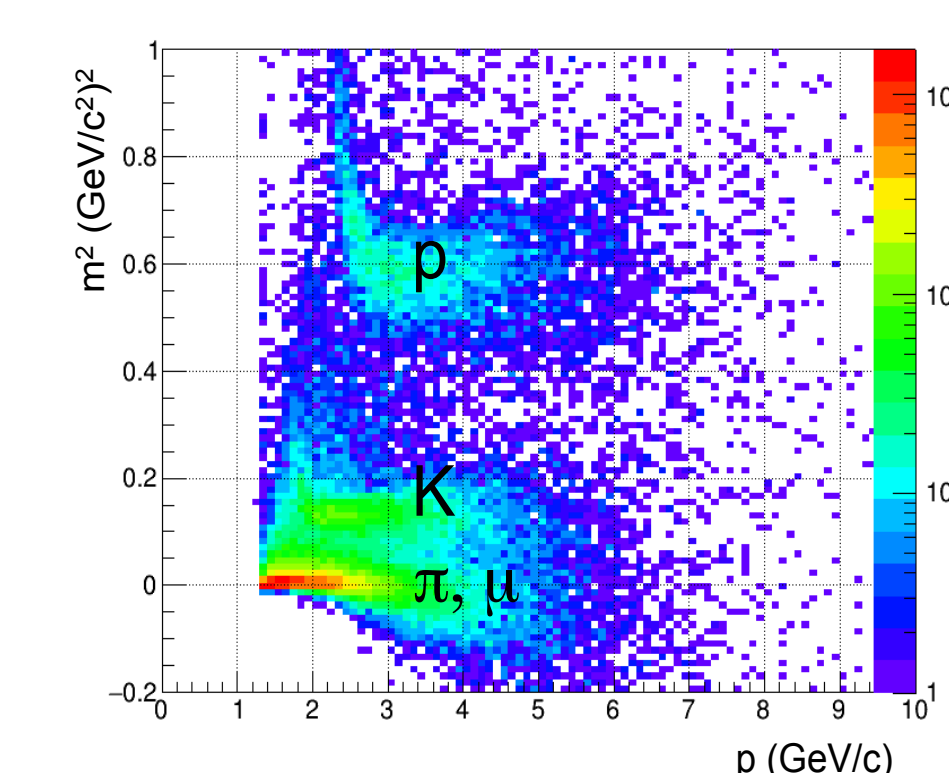
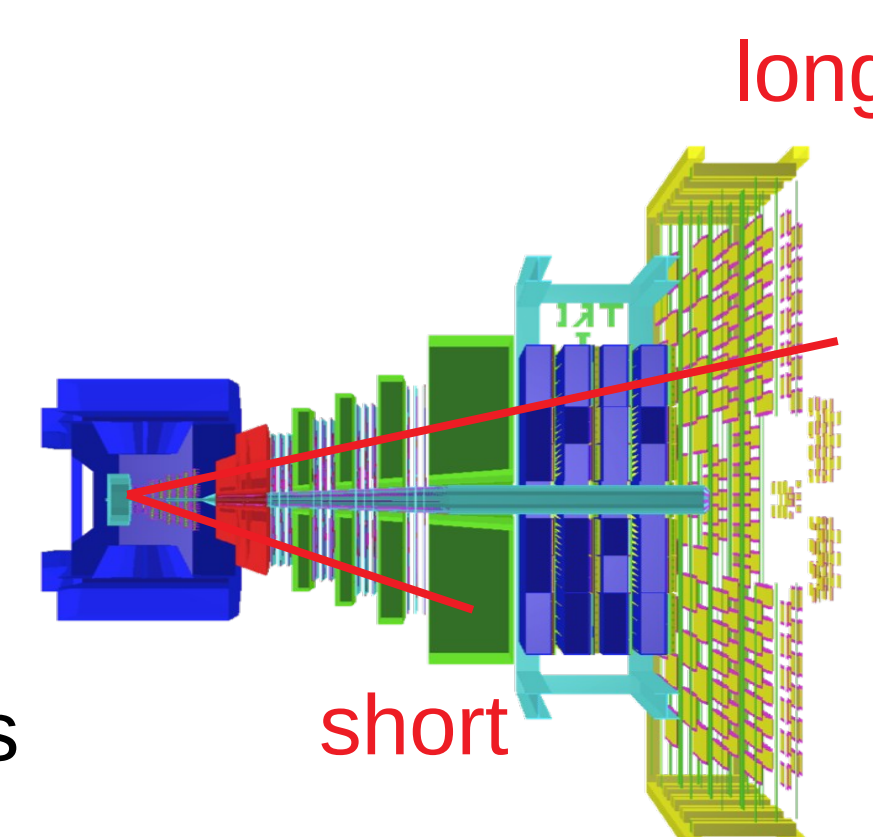


## Muon identification

Exchange RICH by MUCH

Instrumented absorbers:  
60 cm C + (20+20+30+100) cm Fe

Track topology of muon track candidates

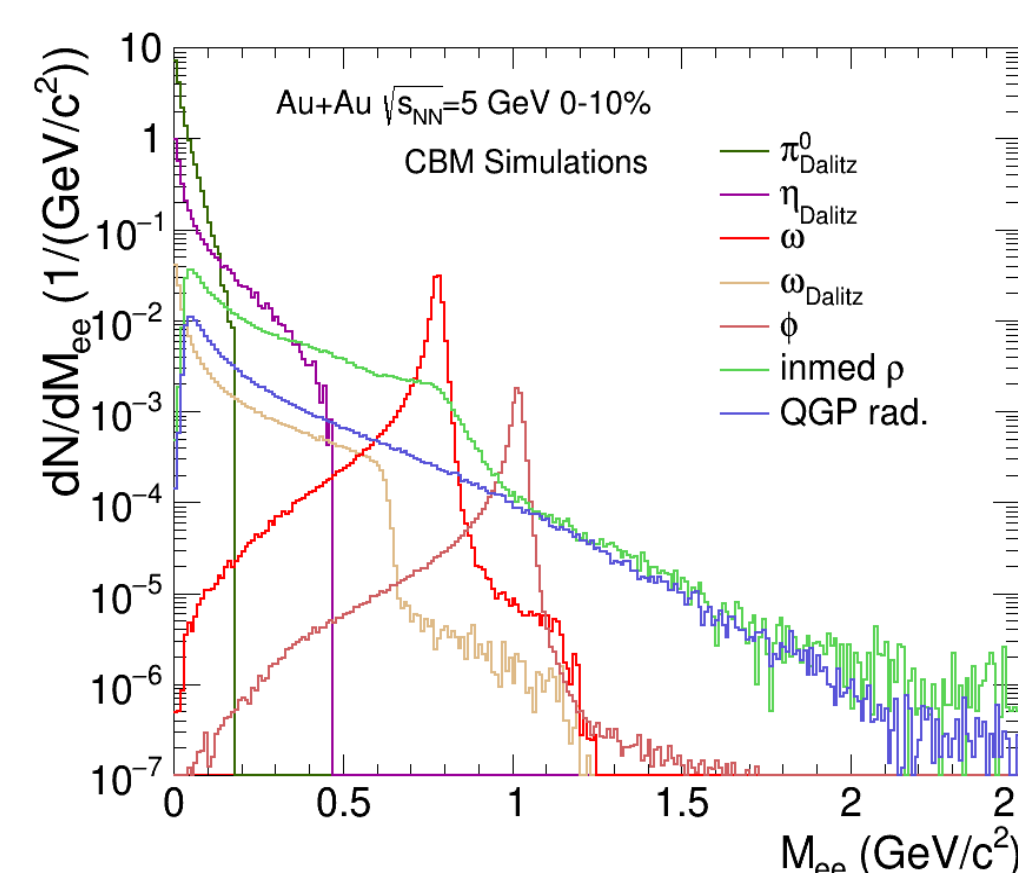


## Simulation input

Background events:  
- 5 million UrQMD events

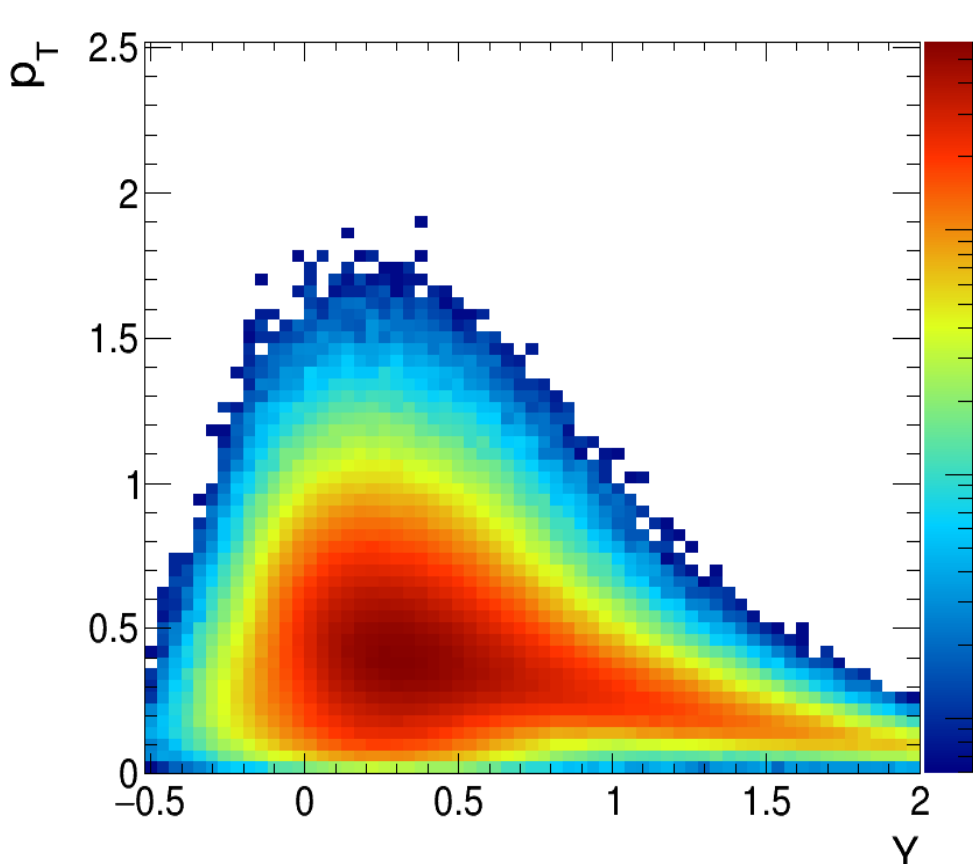
Signals:

- A cocktail of low mass vector mesons  
(W. Cassing et al., Nucl. Phys. A691 (2001) 753)  
- Thermal radiation  
(T. Galatyuk et al., Eur. Phys. J. A52 (2016) 131)



## Phase space

Phase space distribution of reconstructed  $\omega$  signals

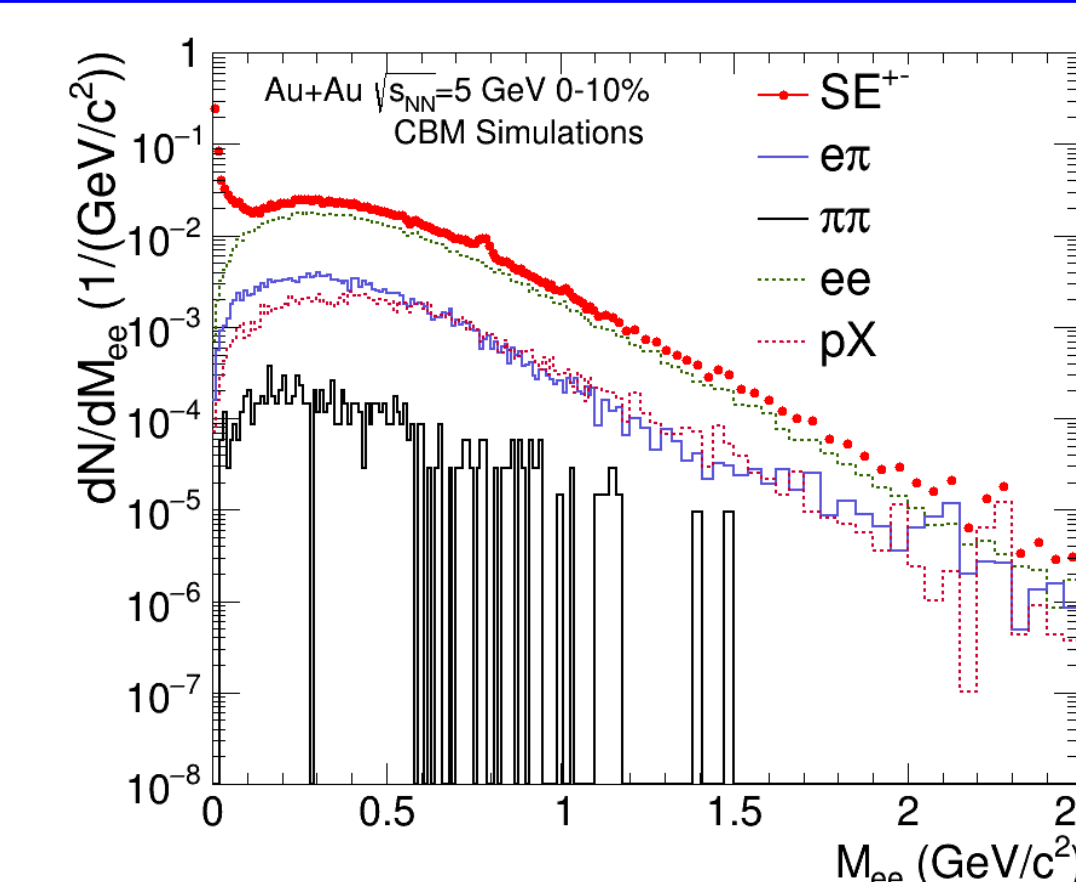


## Invariant mass spectra

### Dielectron Spectra

Combinatorial background at top right

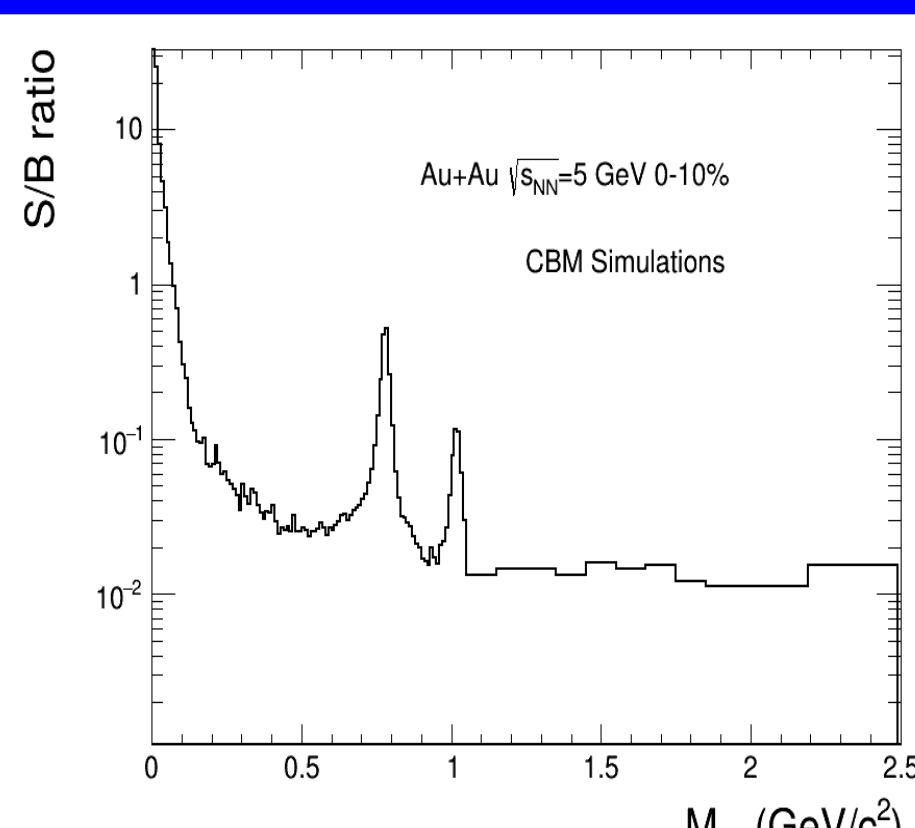
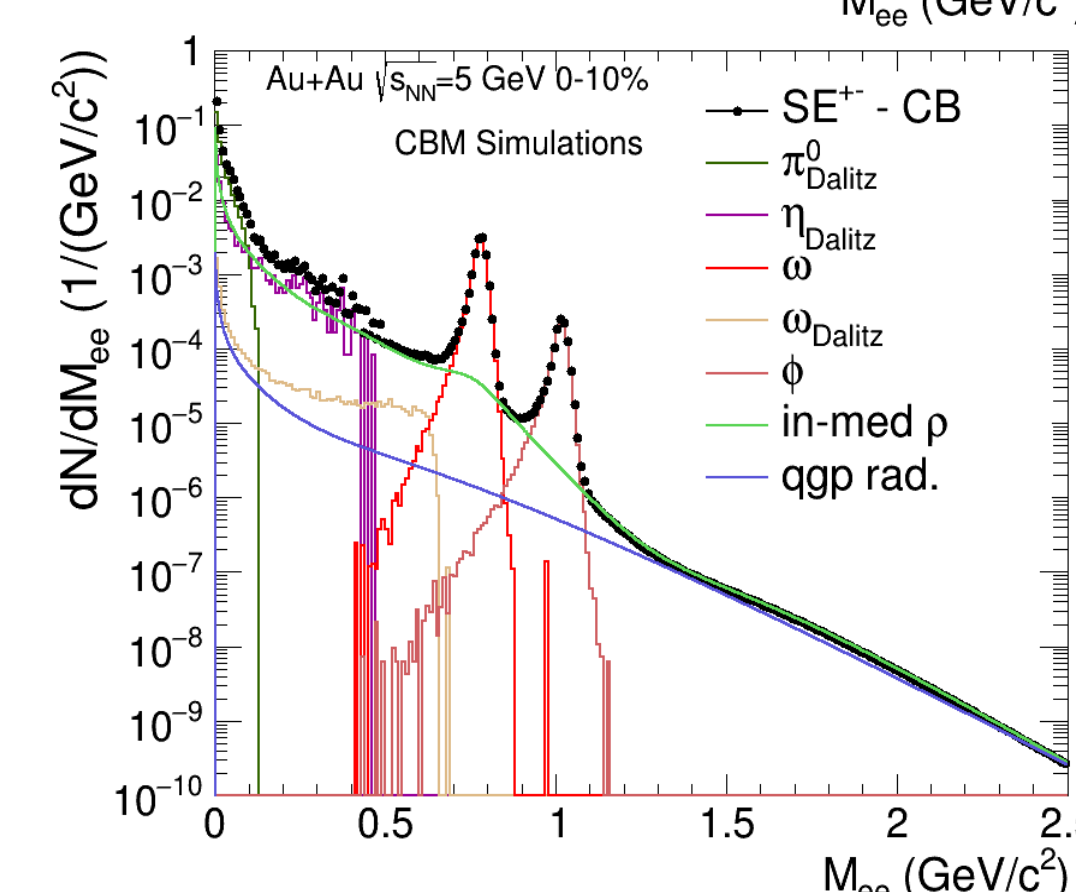
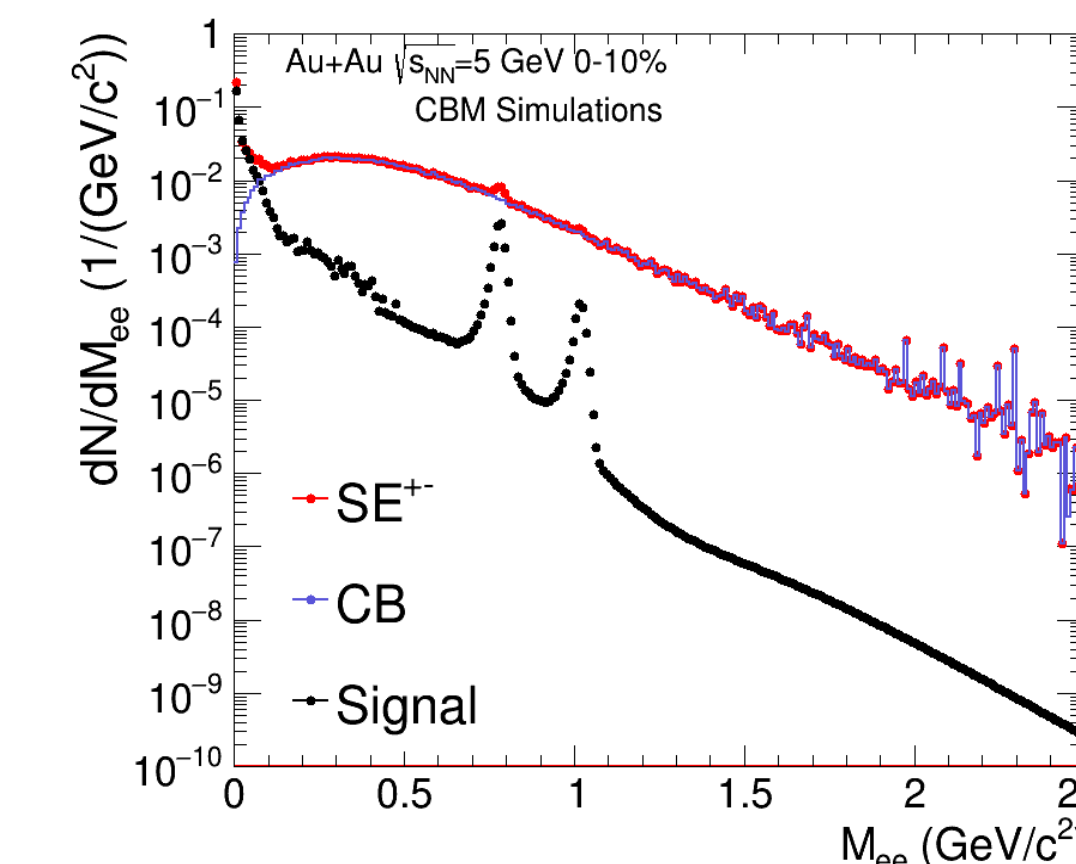
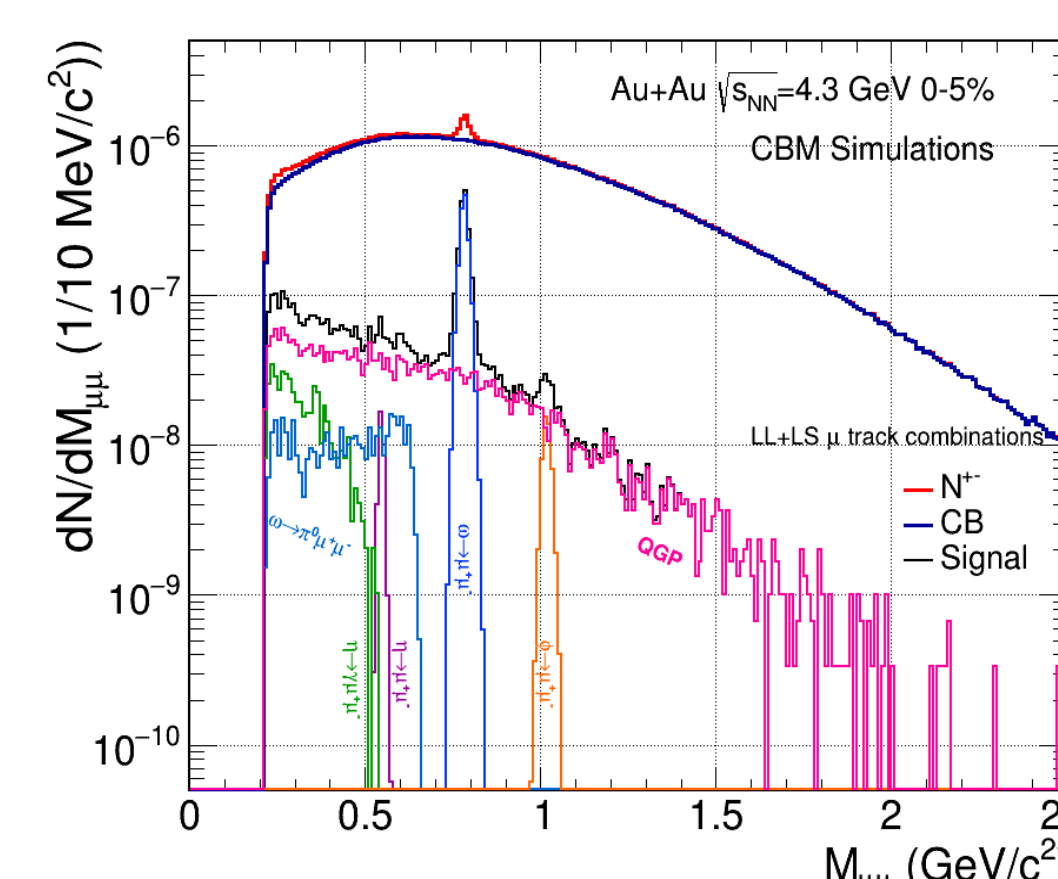
Reconstructed pairs of same events in red



### Dimuon Spectrum

Full scale simulation with 5 million events

Background estimation via event mixing



## Signal-to-background

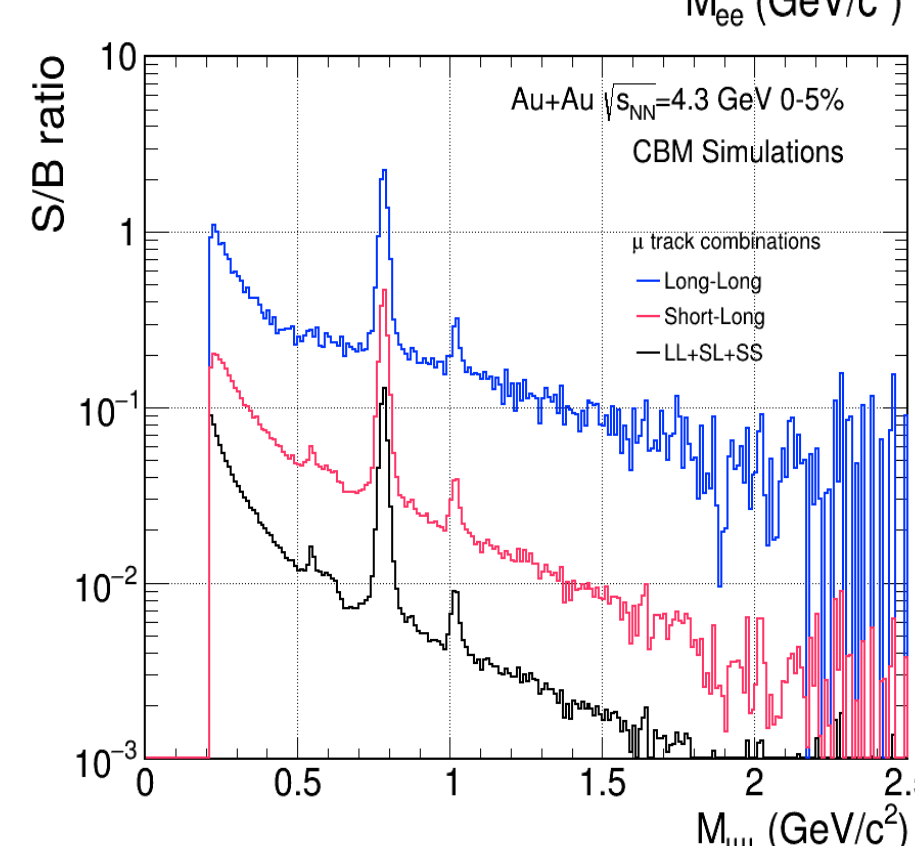
Dielectron ratio top

Dimuon ratio bottom

Signal to combinatorial background ratio above 10%

Especially high ratios for:

-  $\pi^0$   
-  $\omega$   
-  $\phi$



## Thermal radiation

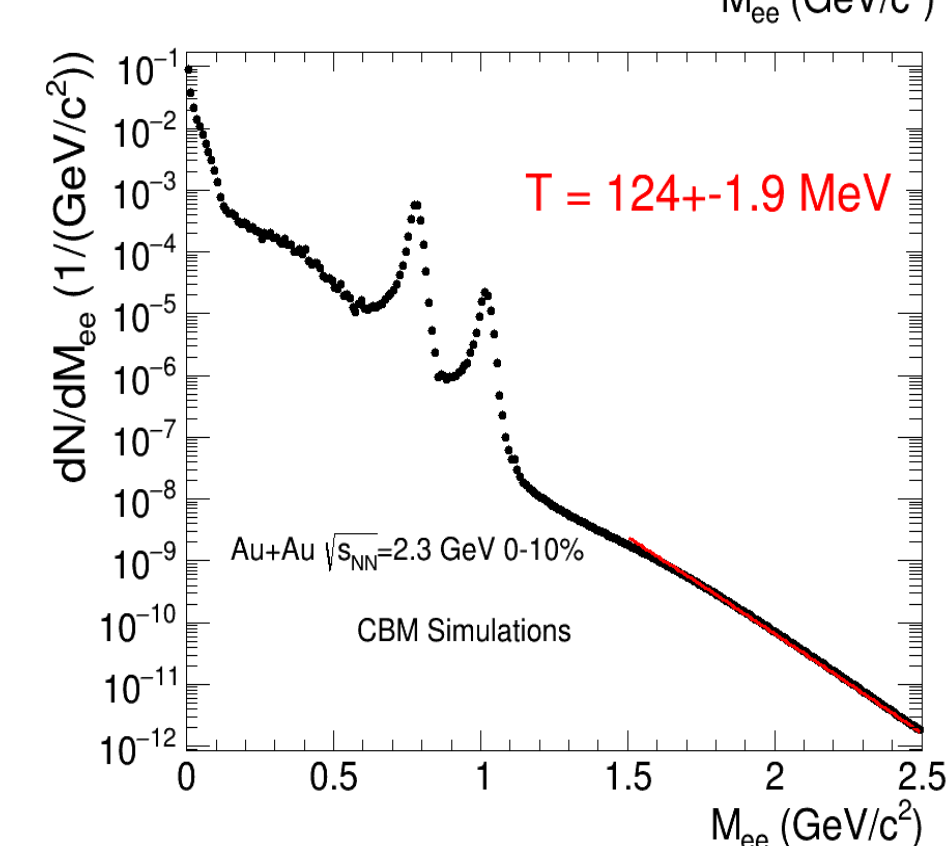
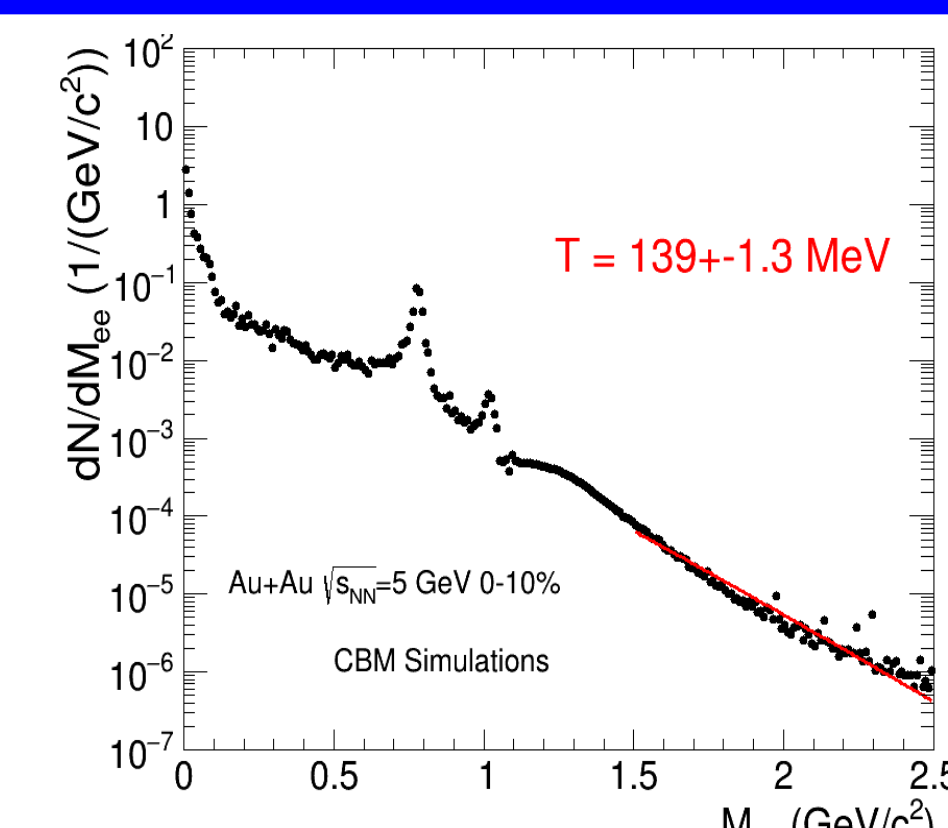
Access to thermal radiation at intermediate mass range

Signals are corrected for acceptance and efficiency

Fitfunction:  $M^{\frac{3}{2}} \cdot e^{-\frac{M}{T}}$

The running day 1 scenario will be 4 weeks at 200 kHz interaction rate  
- Later go to 1-10 MHz

Investigation of systematic errors in progress



Compressed Baryonic Matter experiment at FAIR

