



# Simulation of the $^{124}\text{Xe}+W$ interactions for the SPD BBC detector prototype

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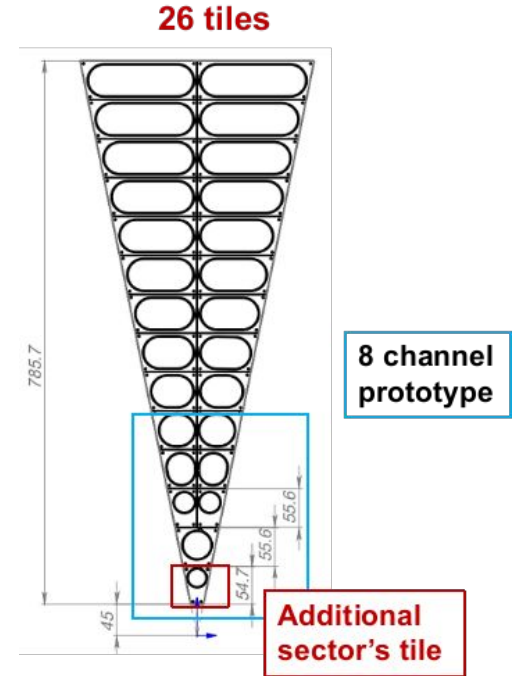
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# Outlook

1. PHQMD generator
2. Condition of the simulation
3. Results of the simulation
4. Conclusions



assembled sector prototype x2



# PHQMD generator

Transport approach is designed to provide a microscopic description of nuclear cluster and hypernucleus formation as well as of general particle production in heavy-ion reactions at relativistic energies. The clusters are identified by the MST or the SACA algorithm which finds the most bound configuration of nucleons and clusters. Collisions among hadrons as well as Quark-Gluon-Plasma formation and parton dynamics in PHQMD are treated in the same way as in the established PHSD transport approach.

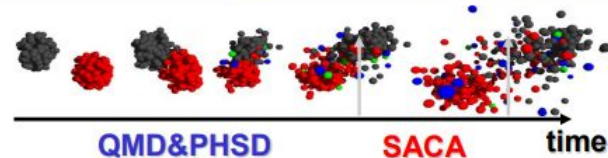
Realization: combined model **PHQMD = (PHSD & QMD) & SACA**

## Parton-Hadron-Quantum-Molecular Dynamics

Initialization → propagation of baryons:  
**QMD (Quantum-Molecular Dynamics)**

Propagation of partons (quarks, gluons) and mesons  
+ **collision integral** = interactions of hadrons and partons (QGP)  
from **PHSD (Parton-Hadron-String Dynamics)**

Clusters recognition:  
**SACA (Simulated Annealing Clusterization Algorithm)**  
vs. **MST (Minimum Spanning Tree)**

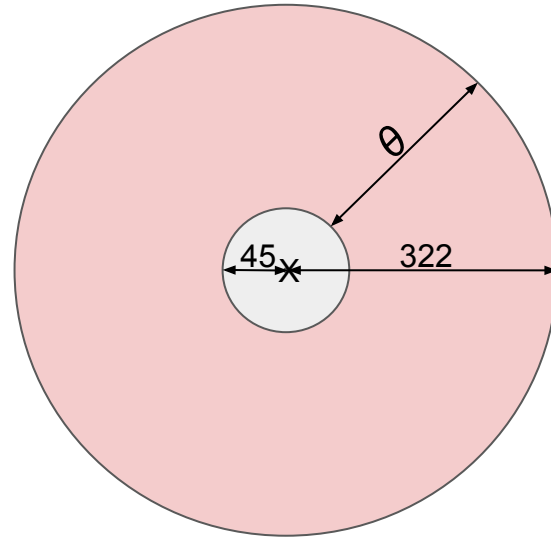


# Condition of the simulation

Beam  $^{124}\text{Xe}$  with energy **3 GeV/n** collides with the **W** target.

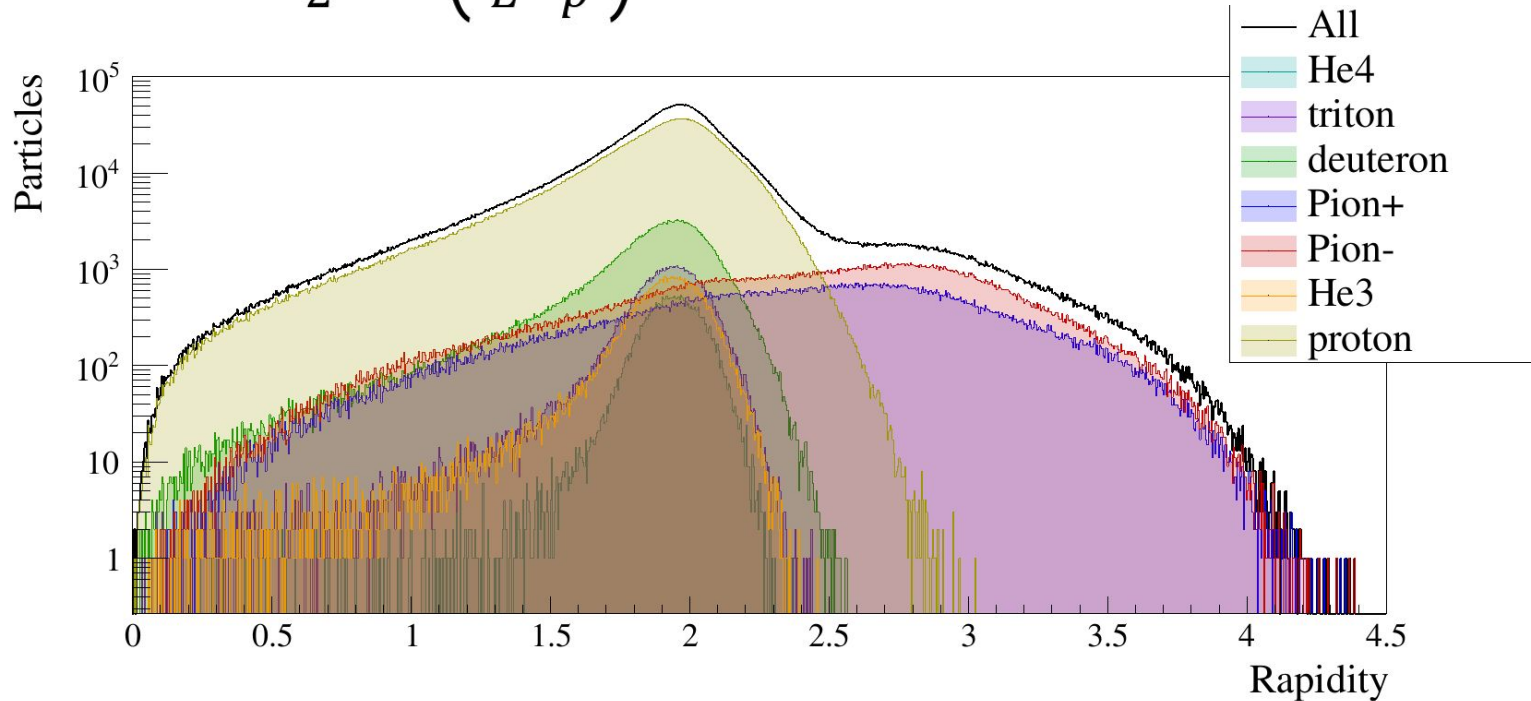
The detector has the shape of a solid **disk** with an inner radius of **45 mm** and an outer radius of **322 mm**. Distance from target to detector  $\sim$  **3m**.

$$1^\circ < \theta < 6.2^\circ$$



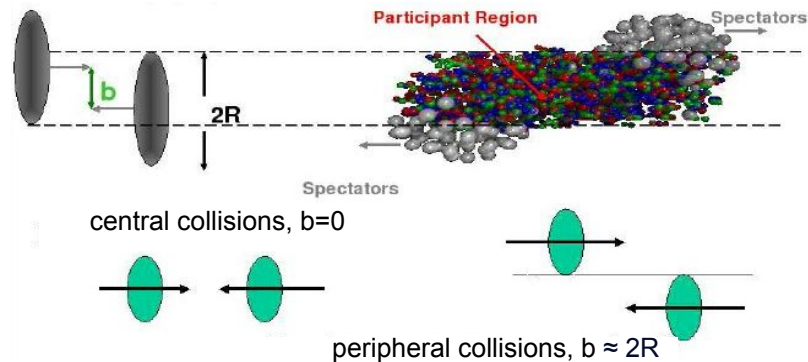
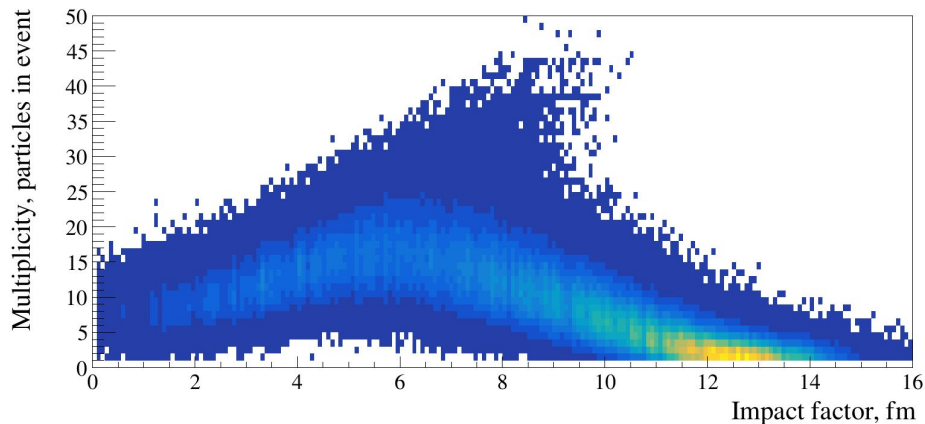
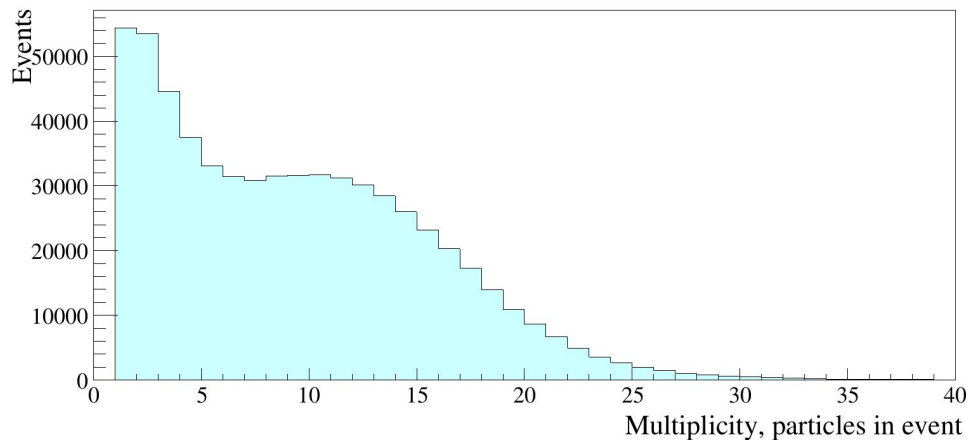
# Rapidity in detector

$$y = \frac{1}{2} \ln \left( \frac{E+p}{E-p} \right)$$



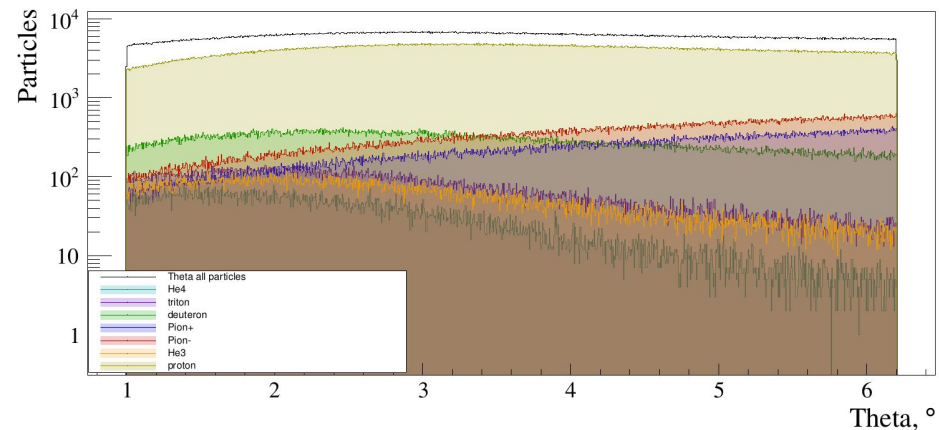
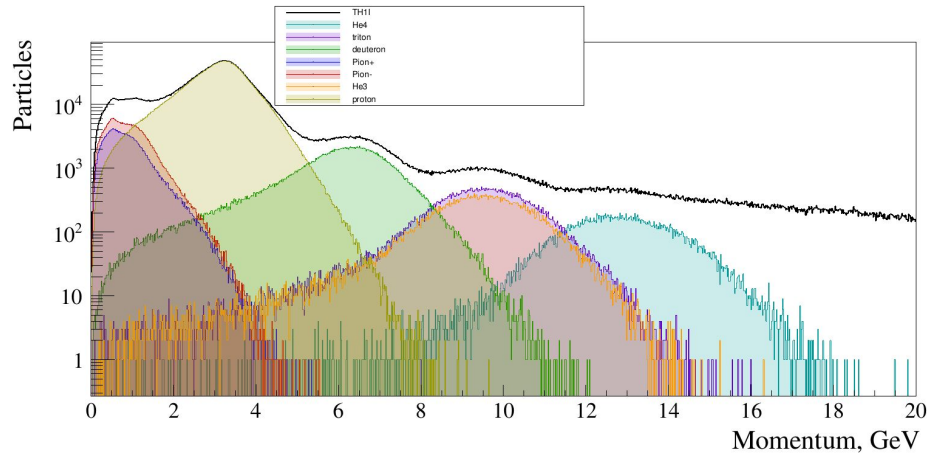
# Multiplicity in detector

*average particles number in event  $\approx 9$*



# Momentum and angular distributions

particles	p	$\pi^+$	$\pi^-$	$^2\text{H}$	$^3\text{H}$	$^3\text{He}$	$^4\text{He}$
%	74.26	4.03	6.18	5.16	1.26	0.98	0.52
average momentum GeV/n	3.02	0.90	0.93	2.96	3.12	3.10	3.19



# Conclusions

1. Simulated interaction of  $^{124}\text{Xe}+\text{W}$  at **3 GeV/n** in the **PHQMD** generator;
2. Particle distributions in the angular range of the detector are shown;
3. A large number of nuclear fragments are observed.

## Future plans

- Simulation with realistic beampipe and **BBC** prototype design for **0-phase**;
- Perform simulation using **other** event **generators** and at **other energies**.



**Thank you for your  
attention!**