



**Faculty
of Physics**

WARSAW UNIVERSITY OF TECHNOLOGY

Modelling Au-Au collisions in NICA collider energy spectrum using MPD programming environment

Marta Monikowska
Maja Tureczek-Zakrzewska

Supervisor: prof. dr hab. inż. Adam Kisiel

**Warsaw University
of Technology**



Outline:



Why?

Outline:



Why?



Software

Outline:



Why?



Software



Tasks

Outline:



Why?



Software



Tasks



Output

Outline:



Why?



Software



Tasks

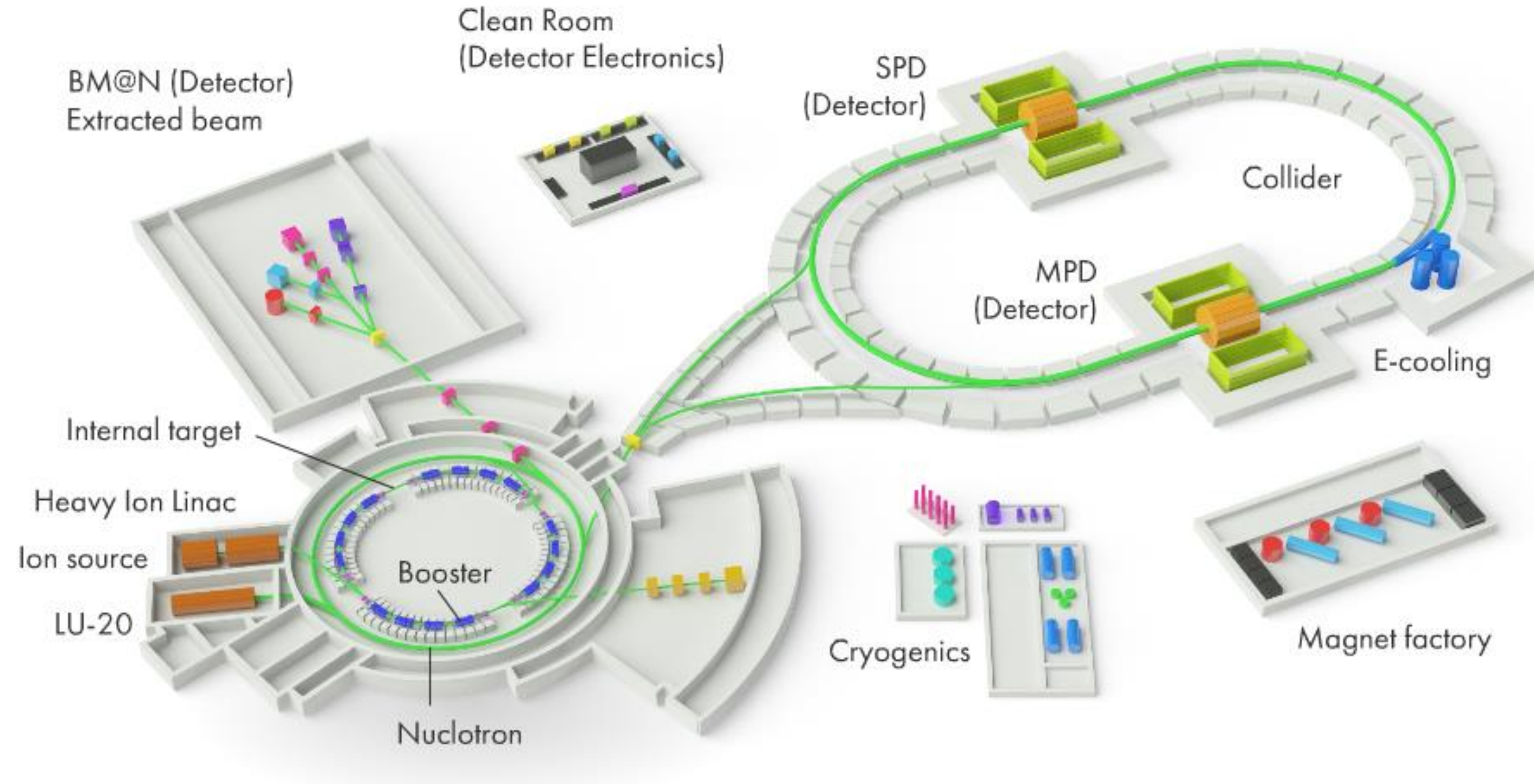


Output



Conclusions

Why?



NICA Complex

MpdRoot

Simulation and Analysis Framework for NICA/MPD Detectors

FairRoot - C++ simulation, reconstruction and analysis framework for particle physics experiments

FairSoft - Repository for installation routines of the external software

UrQMD Version 3.4.

The Ultra Relativistic Quantum Molecular Dynamics

The transport model for simulating heavy ion collisions in the energy range from SIS to RHIC.

It runs on various UNIX-based computing platforms.

UrQMD is designed as multipurpose tool for studying a wide variety of heavy ion related effects ranging from multifragmentation and collective flow to particle production and correlations.

UrQMD Version 3.4. - inputfile

```
#   Ap Zp
pro 197 79      # projectile (here: gold nucleus)
tar 197 79      # target (here: gold nucleus)

nev 200        # number of events
imp 5.         # weighted impact parameter distribution

ecm 9.         # center-of-mass-energy  $v_{NN} = ecm$ 
                between projectile and target

tim 200 200    # time to propagate and output time
                - interval (in fm/c)
```

```
GNU nano 2.3.  File: inputfile
pro 197 79
tar 197 79
█
nev 200
imp 5.

ecm 9.
tim 200 200

eos 0

f13
#f14
f15
f16
f19
f20

XXX
```

UrQMD Version 3.4. - inputfile

```
eos 0      # Equation of State (used in transport part):  
           CASCADE mode  
  
f13       # no output to file13  
#f14     # output to file14  
  
xxx      # end of file
```

```
GNU nano 2.3.  File: inputfile  
pro 197 79  
tar 197 79  
█  
nev 200  
imp 5.  
  
ecm 9.  
tim 200 200  
  
eos 0  
  
f13  
#f14  
f15  
f16  
f19  
f20  
  
xxx
```

Visualisation of data storage

`/eos/nica/mpd/data`

`Urqmd.4GeV`

`JOB_ID`

`gen`

`inputfile`

`test.f14 (UrQMD output)`

`TestEvUrqmd`

`runMC.C`

`reco.C`

`evetest.root (runMC.C output)`

`mpddst.root (reco.C output)`

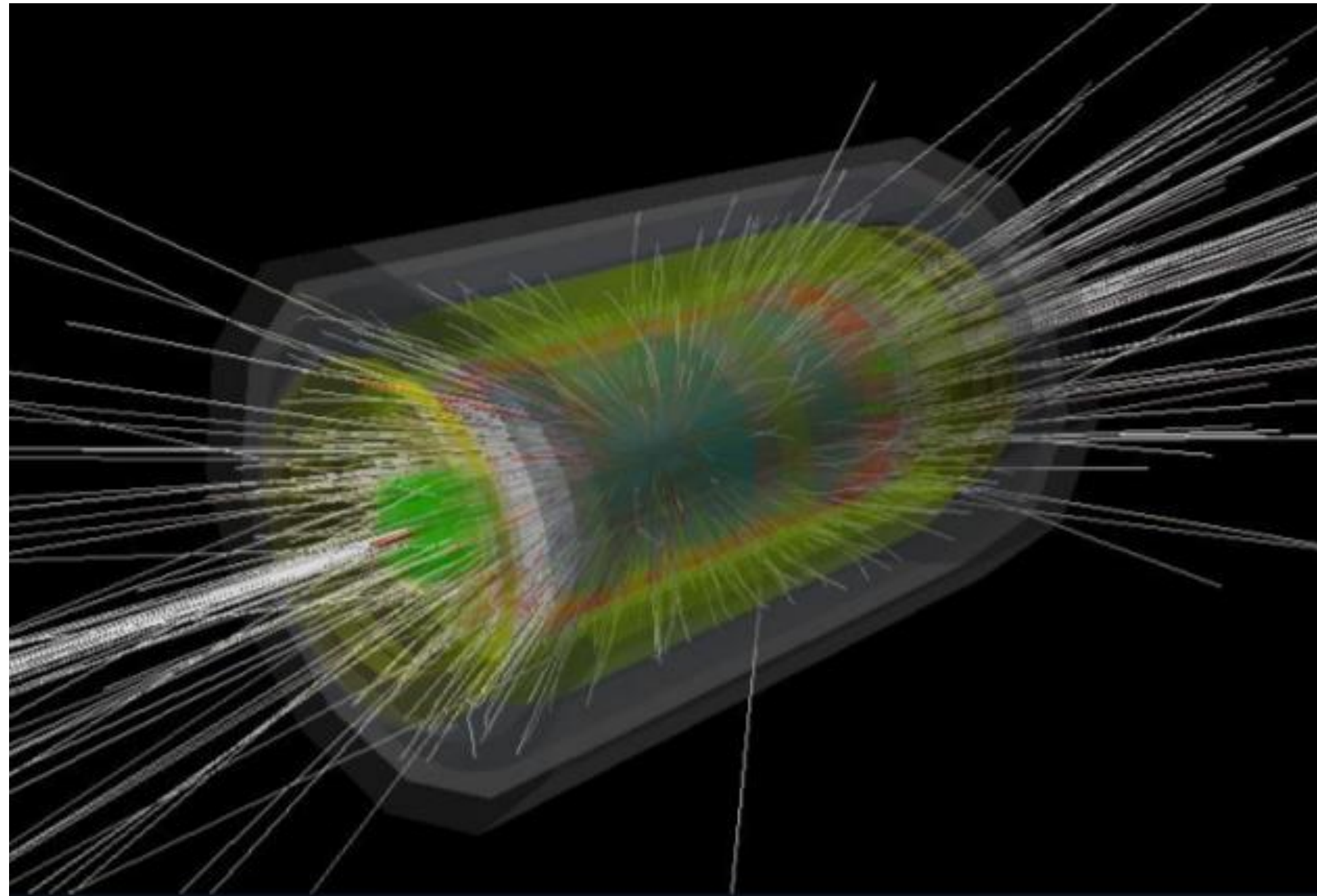
`Job_output_file`

Stored data

ECM	DISC SPACE	JOBS TOTAL	EVENTS	TIME OF SINGLE JOB	
				200 ev	500 ev
11 GeV	17 TB	1800	306212	9h 10 min	22h 30min
9 GeV	7.9 TB	885	263081	8h	18h 40min
7 GeV	5.6 TB	840	224954	5h 40min	14h 30min
4 GeV	2.5 TB	336	168000	N/A	8h 30min

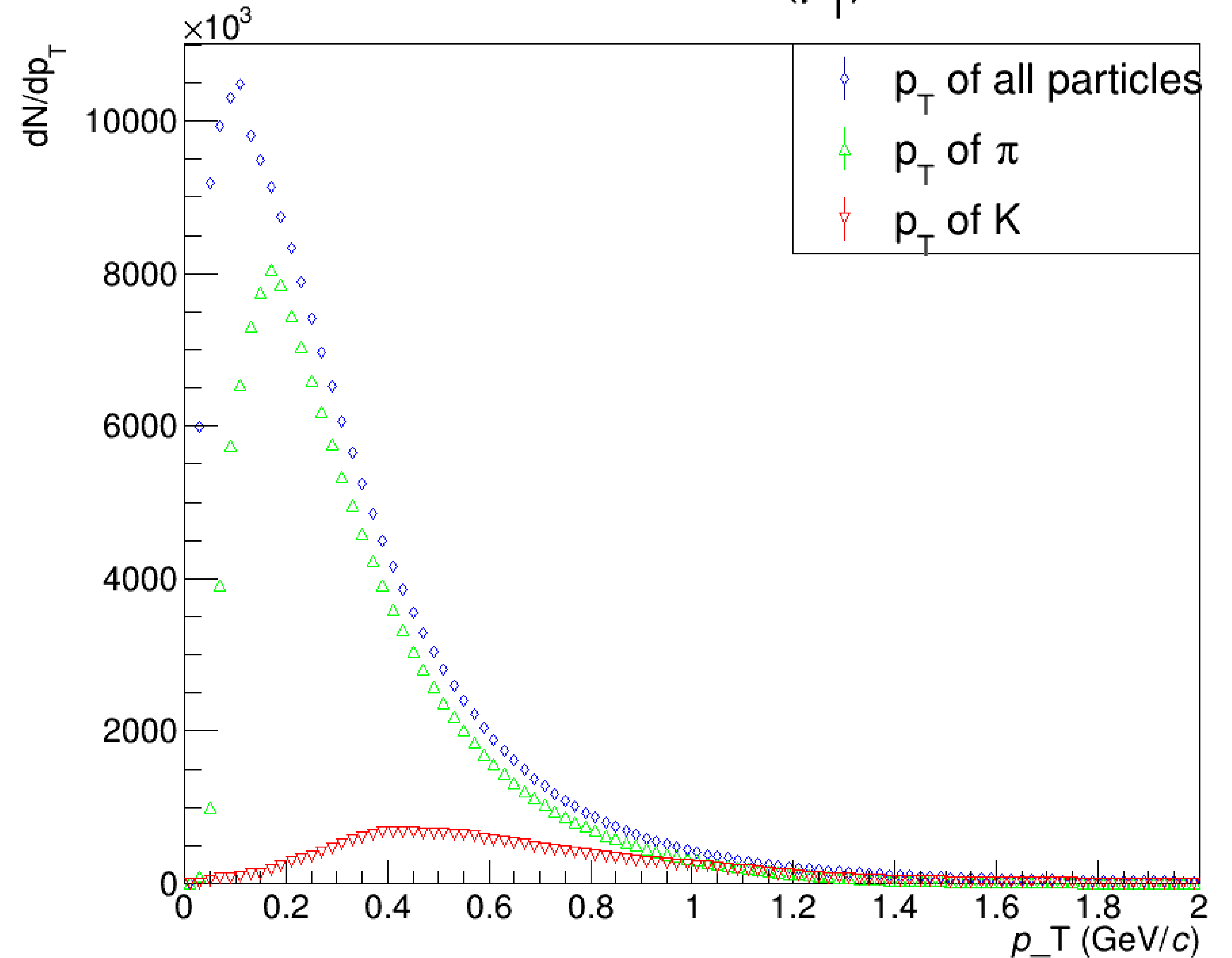
Data at 24.08.2019

Output



Monte Carlo tracs for 11 GeV

Transverse Momentum (p_T) for 9GeV



Conclusions

We are one of the first users of NICA cluster

We know how to simulate Au-Au collisions for MPD

Used energies 4GeV, 7GeV, 9GeV and 11GeV

Generating data is still work in progress

Nowadays efficiency rates over 95%

Huge progress

ECM	DISK SPCE	DISK SPACE
	24.08	24.10
11 GeV	17 TB	36 TB
9 GeV	7.9 TB	41 TB
7 GeV	5.6 TB	25 TB

References:

<http://mpd.jinr.ru>

https://indico.cern.ch/event/802303/contributions/3590232/attachments/1928637/3195008/Mateusz_Kowal-Development_of_visualisation_for_MPD_experiment.pdf

<https://github.com/FairRootGroup>

<https://git.jinr.ru/nica/mpdroot>

In cooperation with Łukasz Sawicki and Jakub Zieliński



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Thank You for Attention

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