
NICA
MPD
Collaboration Status

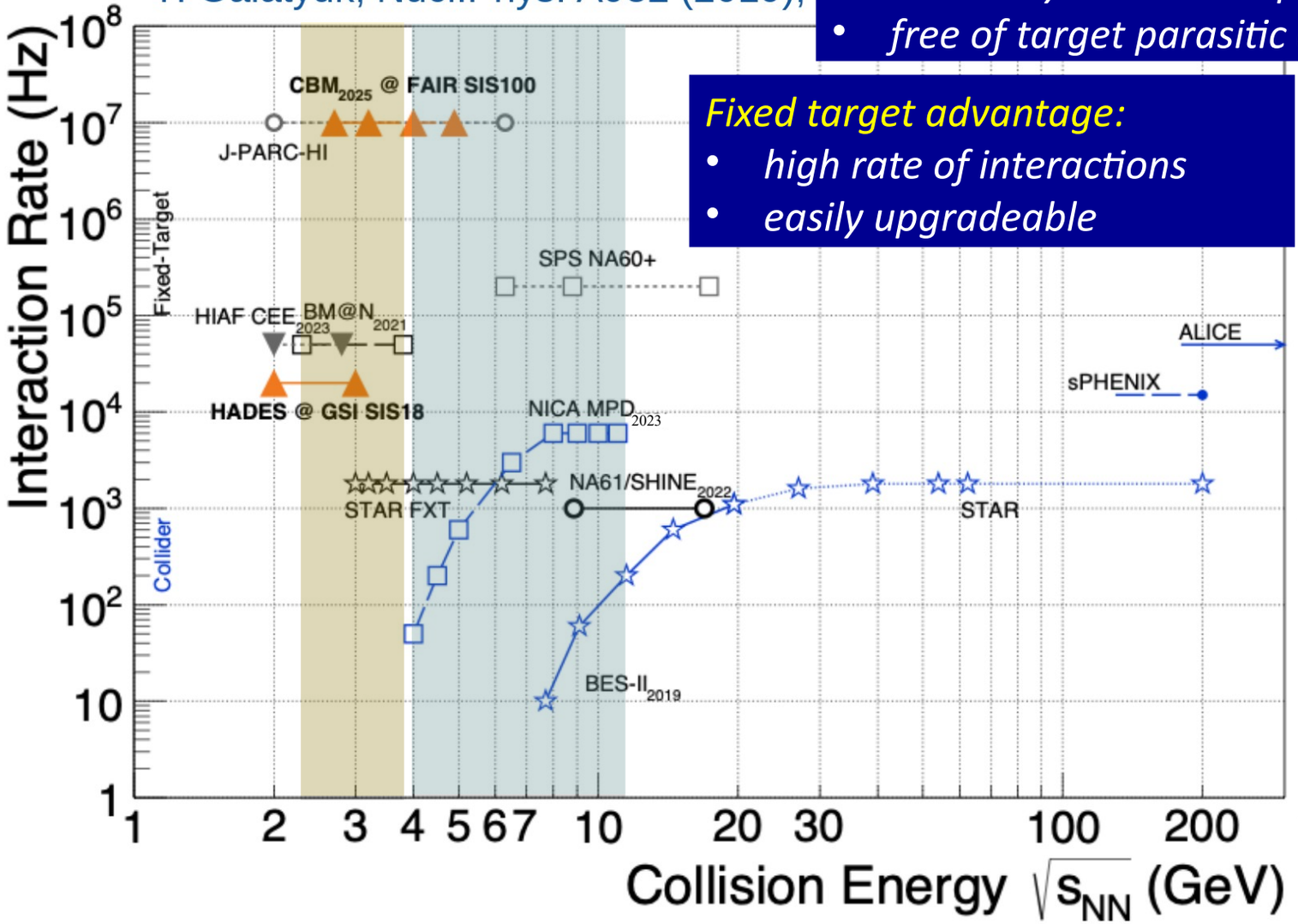
NICA: Unique and complementary

Collider advantage:
- *coverage of max. phase space*
- *minimally biased acceptance*
- *free of target parasitic effects*

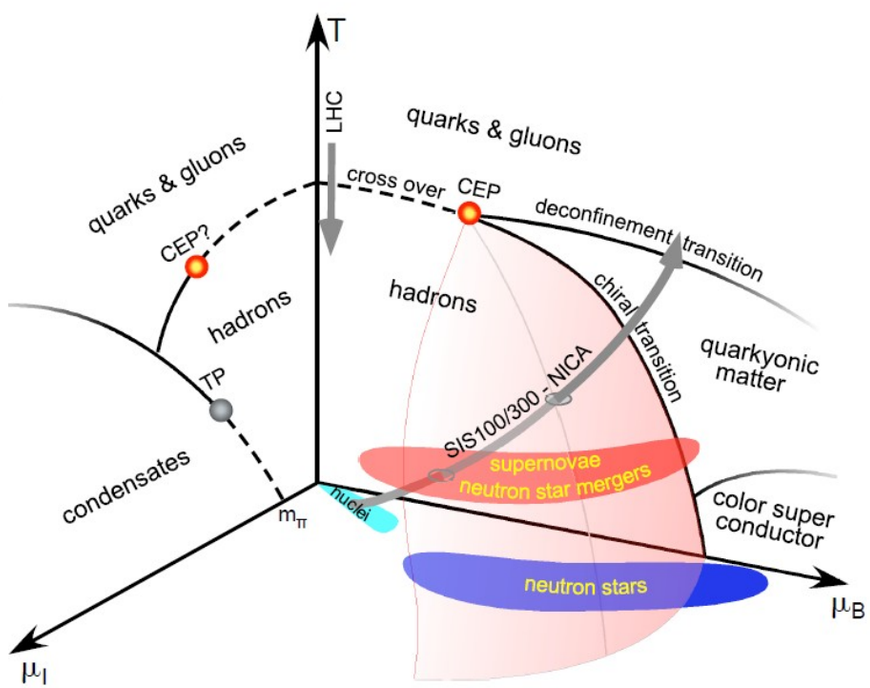
Fixed target advantage:
- *high rate of interactions*
- *easily upgradeable*

In NICA energy range maximum possible net-baryon density is reached

T. Galatyuk, Nucl.Phys. A982 (2019);



NUPECC Long Range Plan 2017

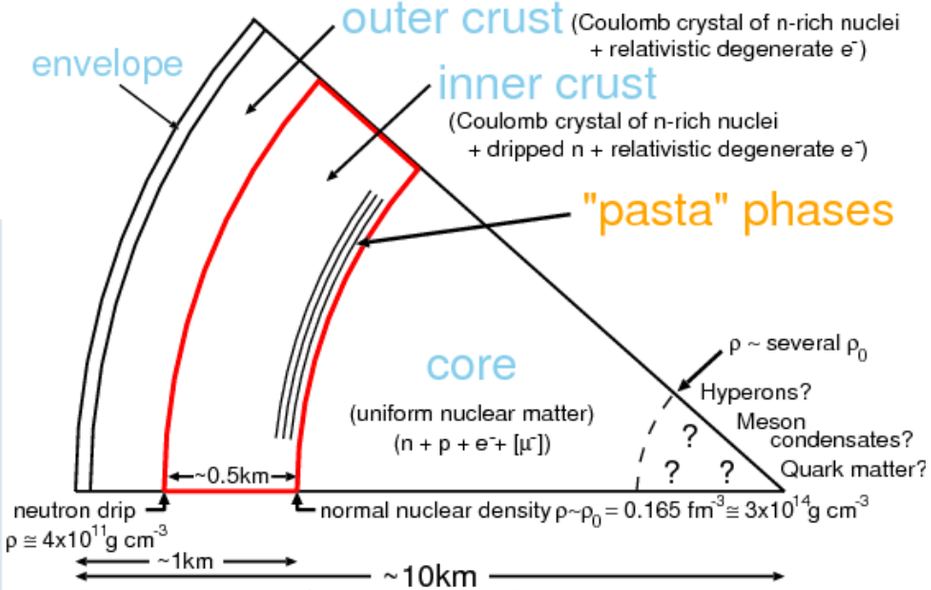


Access neutron star matter in laboratory

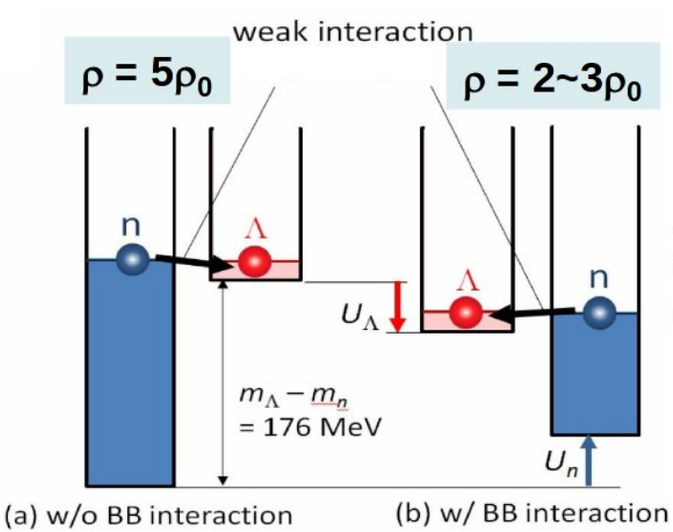
core of neutron stars reaches density several times nuclear density

appearance of strangeness changes Equation-of-State, depends on strangeness-nucleon interaction

Credit: LIGO Collaboration

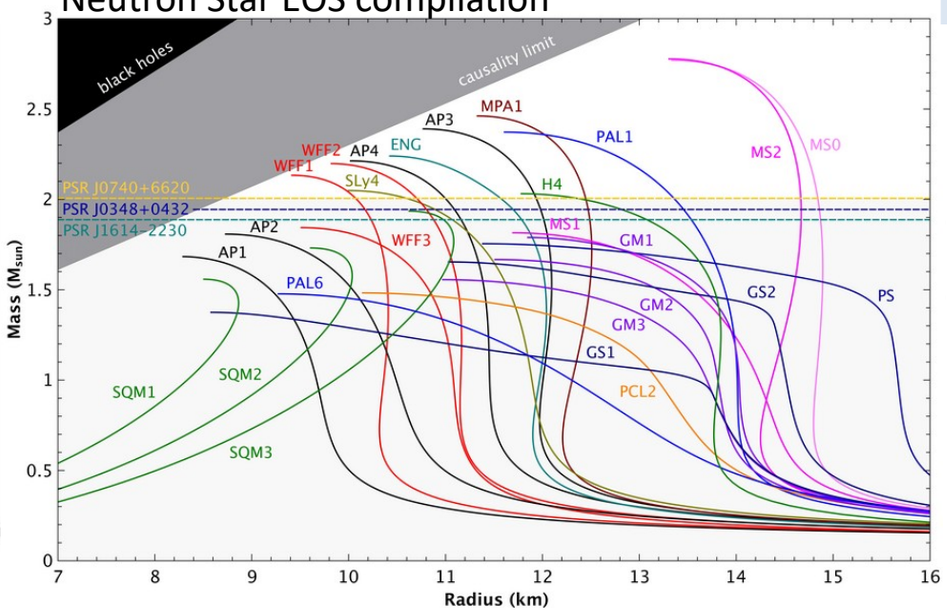


Demorest et al., Nature 467, 1081

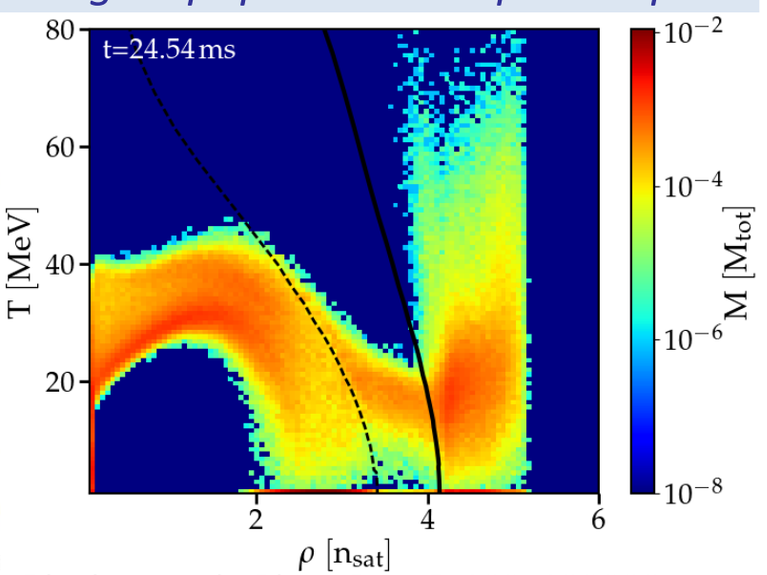


H. Tamura, Hadron 2017

Neutron Star EOS compilation



mergers populate NICA phase space



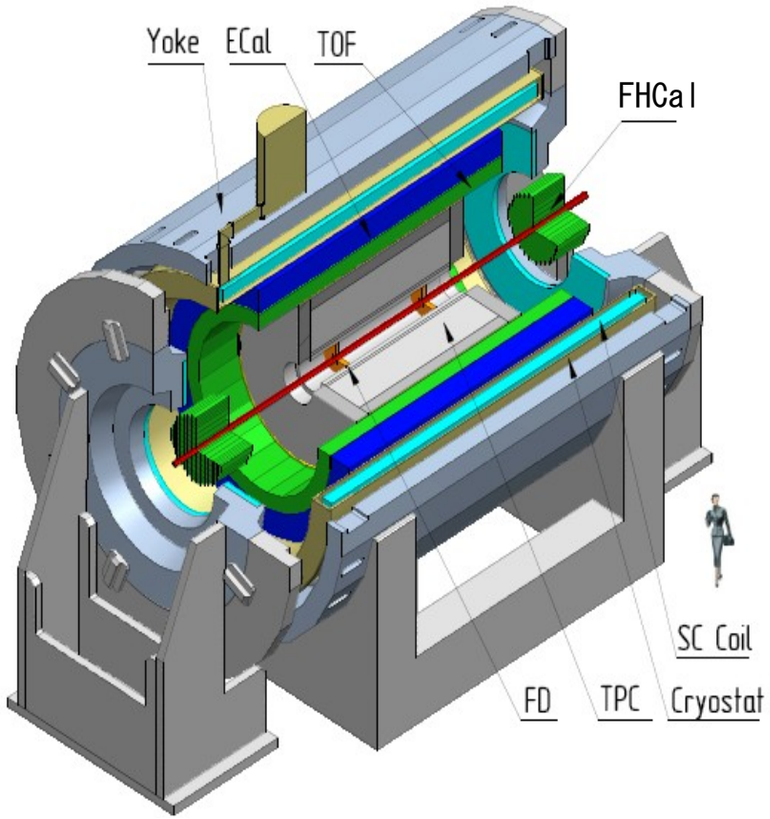
Blacker et al., Phys. Rev. D 102, 123023

Why MPD at NICA?

- Common question: why is NICA/MPD needed, when there is NA61/SHINE at SPS, STAR BES (with FXT) and FAIR?

	NA61/SHINE at SPS	**CBM at FAIR**	**STAR BES+FXT at RHIC**	**MPD + BM@N at NICA**
Coverage of region of transition from baryon to meson dominance („horn”)	only higher $\sqrt{s_{NN}}$	only lower $\sqrt{s_{NN}}$	Yes (mixing collider and fixed target)	Yes (consistent acceptance)
expected luminosity (w.r.t. MPD)	lower	higher	lower	reference
possibility for system size scan	yes	yes	yes (?)	yes
full centrality range	no	yes (?)	yes	yes
acceptance type	Fixed target	Fixed target	Collider + fixed target	Collider + fixed target
running plan (heavy-ions)	approved for 2021 (per-year decision)	beyond 2025	running concluded in 2021	2023 and beyond
status at the facility (possible running time)	in competition with many projects (LHC)	CBM one of four main experiments	end of datataking (heavy-ion) in 2021	flagship experiments several months/year

Multi-Purpose Detector (MPD) Collaboration



NICA

12 *Countries,* ***>500*** *participants,*
42 *Institutes and* ***JINR***

AANL, Yerevan, ***Armenia;***
Baku State University, NNRC, ***Azerbaijan****;*
Plovdiv University Paisii Hilendarski, ***Bulgaria;***
University Tecnica Federico Santa Maria, Valparaiso, ***Chile****;*
Tsinghua University, Beijing, ***China****;*
USTC, Hefei, ***China****;*
Huzhou University, Huizhou, ***China****;*
Central China Normal University, ***China****;*
Fudan University, Shanghai, ***China****;*
Shandong University, Qingdao, ***China****;*
SNST, UCAS, Beijing, ***China****;*
University of South China, ***China****;*

Applying to join MPD:

Pavol Jozef Šafárik University,
Slovakia

Three Gorges University, ***China****;*
Institute of Modern Physics, CAS, Lanzhou, ***China****;*
Palacky University, Olomouc, ***Czech Republic****;*
NPI CAS, Rez, ***Czech Republic****;*
Tbilisi State University, Tbilisi, ***Georgia****;*
Joint Institute for Nuclear Research*;*
FCFM-BUAP Puebla, ***Mexico****;*
FC-University of Colima, Colima, ***Mexico****;*
FCFM-UAS, Culiacán, ***Mexico****;*
ICN-UNAM, Mexico City, ***Mexico****;*
CINVESTAV, Mexico City, ***Mexico****;*
Universidad Autónoma Metropolitana, Iztapalpa, ***Mexico****;*
Institute of Applied Physics, Chisinev, ***Moldova****;*
WUT, Warsaw, ***Poland****;*
NCNR, Otwock – Świerk, ***Poland****;*
University of Wrocław, ***Poland****;*
University of Silesia, Katowice, ***Poland;***
University of Warsaw, ***Poland****;*
Jan Kochanowski University, Kielce, ***Poland****;*
Institute of Nuclear Physics, PAS, Cracow, ***Poland****;*
Belgorod National Research University, ***Russia****;*
INR RAS, Moscow, ***Russia****;*
NRNU MEPhI, Moscow, ***Russia****;*
Moscow Institute of Science and Technology, ***Russia****;*
North Osetian State University, ***Russia****;*
NRC Kurchatov Institute, ITEP, ***Russia****;*
Kurchatov Institute, Moscow, ***Russia****;*
St. Petersburg State University, ***Russia;***
SINP, Moscow, ***Russia****;*
PNPI, Gatchina, ***Russia****;*
Vinča Institute of Nuclear Sciences, Belgrade, ***Serbia****;*

Memorandum of Understanding

- Memorandum of Understanding formalizes the participation of the Institution in the Collaboration, defines its rights and obligations
- Currently MPD MoU ready for: **Mexican** Consortium MexNICA, **Poland**: WUT, NCBJ, Warsaw University, UJK in Kielce, University of Wrocław, University of Silesia, **Czech Republic**: Palacky University, NPI CAS, **Azerbaijan**: NNRC Baku, **Bulgaria**: Plovdiv University, **Russian Federation**: SPSU, INR RAS, SINP MSU, Belgorod State University, MIPT Moscow, NRC „Kurchatov Institute" – ITEP, **Armenia:** A. Alikahnyan National Lab of Armenia, **China:** Tsinghua University, University of Chinese Academy of Sciences, Central China Normal University, Fudan University, University of Science and Technology of China
- Recently signed MoUs: **Poland:** Institute for Nuclear Physics of Polish Academy of Sciences, **China:** Huzhou University, University of South China, Three Gorges University, Shandong University, **Russia:** Petersburg Nuclear Physics Institute, MEPhI NRNU

MPD Physics Programme

G. Feofilov, A. Ivashkin — 1

Global observables

- Total event multiplicity
- Total event energy
- Centrality determination
- Total cross-section measurement
- Event plane measurement at all rapidities
- Spectator measurement

V. Kolesnikov, Xianglei Zhu — 2

Spectra of light flavor and hypernuclei

- Light flavor spectra
- Hyperons and hypernuclei
- Total particle yields and yield ratios
- Kinematic and chemical properties of the event
- Mapping QCD Phase Diag.

K. Mikhailov, A. Taranenko — 3

Correlations and Fluctuations

- Collective flow for hadrons
- Vorticity, Λ polarization
- E-by-E fluctuation of multiplicity, momentum and conserved quantities
- Femtoscopy
- Forward-Backward corr.
- Jet-like correlations

V. Riabov, Chi Yang — 4

Electromagnetic probes

- Electromagnetic calorimeter meas.
- Photons in ECAL and central barrel
- Low mass dilepton spectra in-medium modification of resonances and intermediate mass region

Wangmei Zha, A. Zinchenko — 5

Heavy flavor

- Study of open charm production
- Charmonium with ECAL and central barrel
- Charmed meson through secondary vertices in ITS and HF electrons
- Explore production at charm threshold

MPD Status and Performance Publication

Status and initial physics performance studies of the MPD experiment at NICA

The MPD Collaboration[1]

[1]The full list of Collaboration Members is provided at the end of the manuscript

Received: October 10, 2021/ Accepted: date

Abstract The Nuclotron-based Ion Collider fAcility (NICA) is under construction at the Joint Institute for Nuclear Research (JINR), with commissioning of the facility expected in late 2022. The Multi-Purpose Detector (MPD) has been designed to operate at NICA and its components are currently in production. The detector is expected to be ready for data taking with the first beams from NICA. This document provides an overview of the landscape of the investigation of the QCD phase diagram in the region of maximum baryonic density, where NICA and MPD will be able to provide significant and unique input. It also provides a detailed description of the MPD set-up, including its various subsystems as well as its support and computing infrastructures. Selected performance studies for particular physics measurements at MPD are presented and discussed in the context of existing data and theoretical expectations.

Keywords NICA · MPD · QCD

Contents

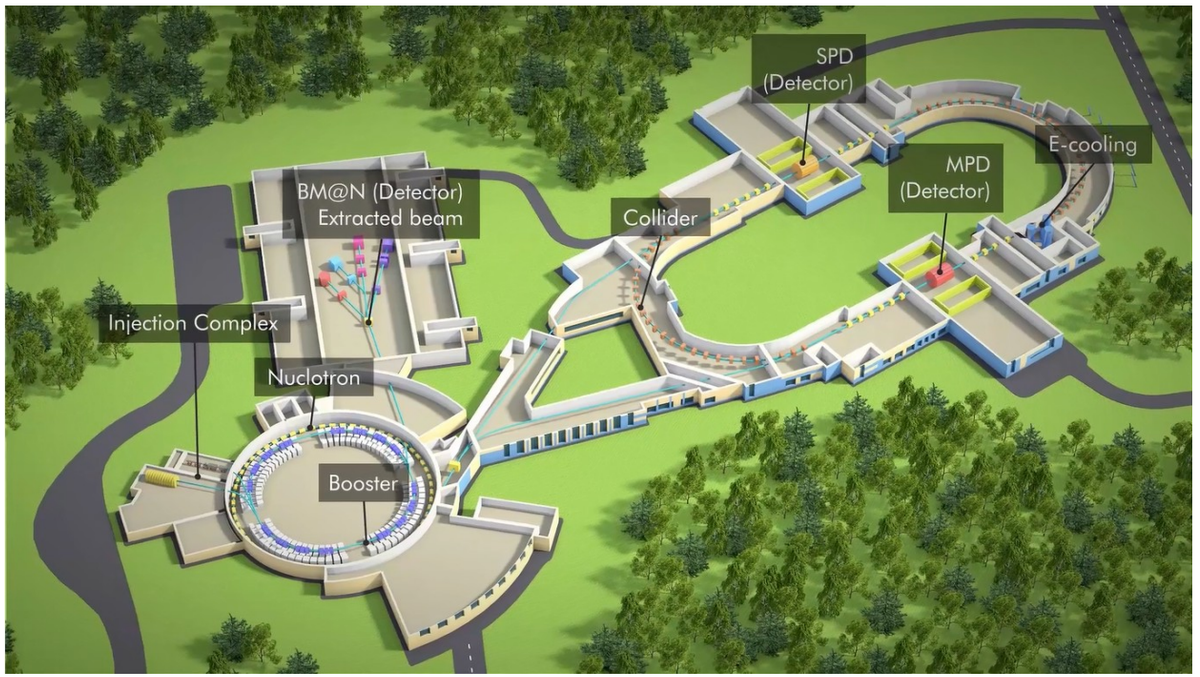
1 Introduction

The Multi-Purpose Detector (MPD) is one of the two dedicated heavy-ion collision experiments of the Nuclotron-based Ion Collider fAcility (NICA), one of the flagship projects, planned to come into operation at the Joint Institute for Nuclear Research (JINR) in 2022. Its main scientific purpose is to search for novel phenomena in the baryon-rich region of the QCD

- Editorial Committee: A. Ayala, D. Blaschke, S. Golovatyuk, A. Kisiel, V. Kolesnikov, V. Riabov, O. Rogachevsky, A. Taranenko + Internal Review Committee: I. Tserruya (chair), F. Wang, Z. Tang
- Main physics goals of MPD in the landscape of current heavy-ion physics and astrophysics and status of the readiness of the MPD detector subsystems
- Report on example expected physics results on the first run of MPD, with relation to expected detector performance
- Second round of Collaboration Review conducted from Aug 27th until September 10th.
- Final version expected in the coming weeks

NICA Facility running plan

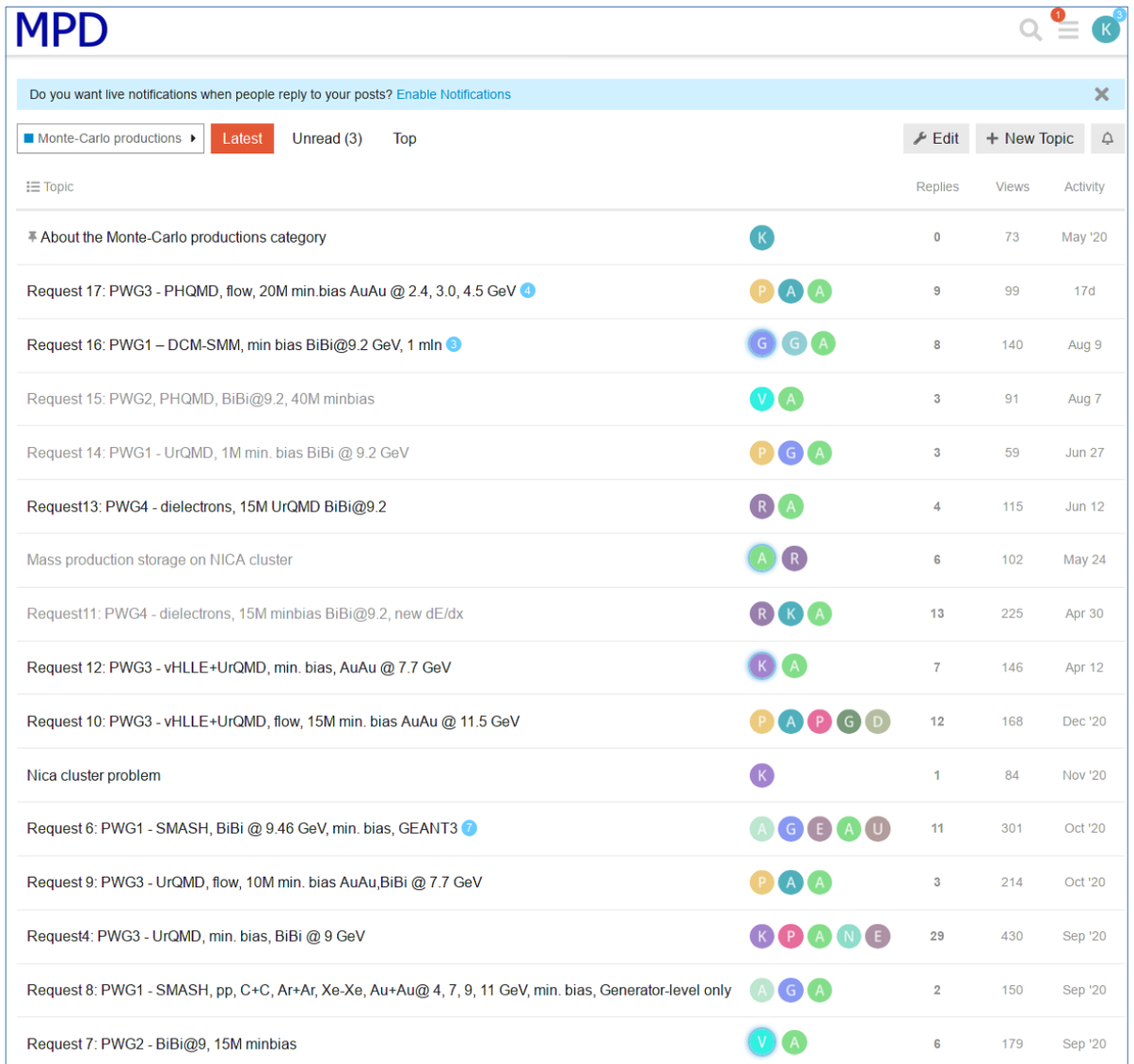
- **Year 2021:**
  - Extensive commissioning of Booster accelerator
  - Heavy-ion (Fe/Kr/Xe) run of full Booster+Nuclotron setup
- **Year 2022:**
  - Completion of NICA Collider and transfer lines
- **Year 2023:**
  - Initial run of NICA with Bi+Bi @ 9.2 AGeV (other energies a second priority)
  - Goal to reach luminosity of 10^{25} $cm^{-2}s^{-1}$, at least 10^{8} collisions at 9.2 AGeV
- **Year 2024:**
  - Goal to have Au+Au collisions and acceleration in NICA (up to 11 AGeV)
- **Beyond 2024:**
  - Maximizing luminosity, possibility of collision energy and system size scan



Next: „First Physics in MPD” Publication

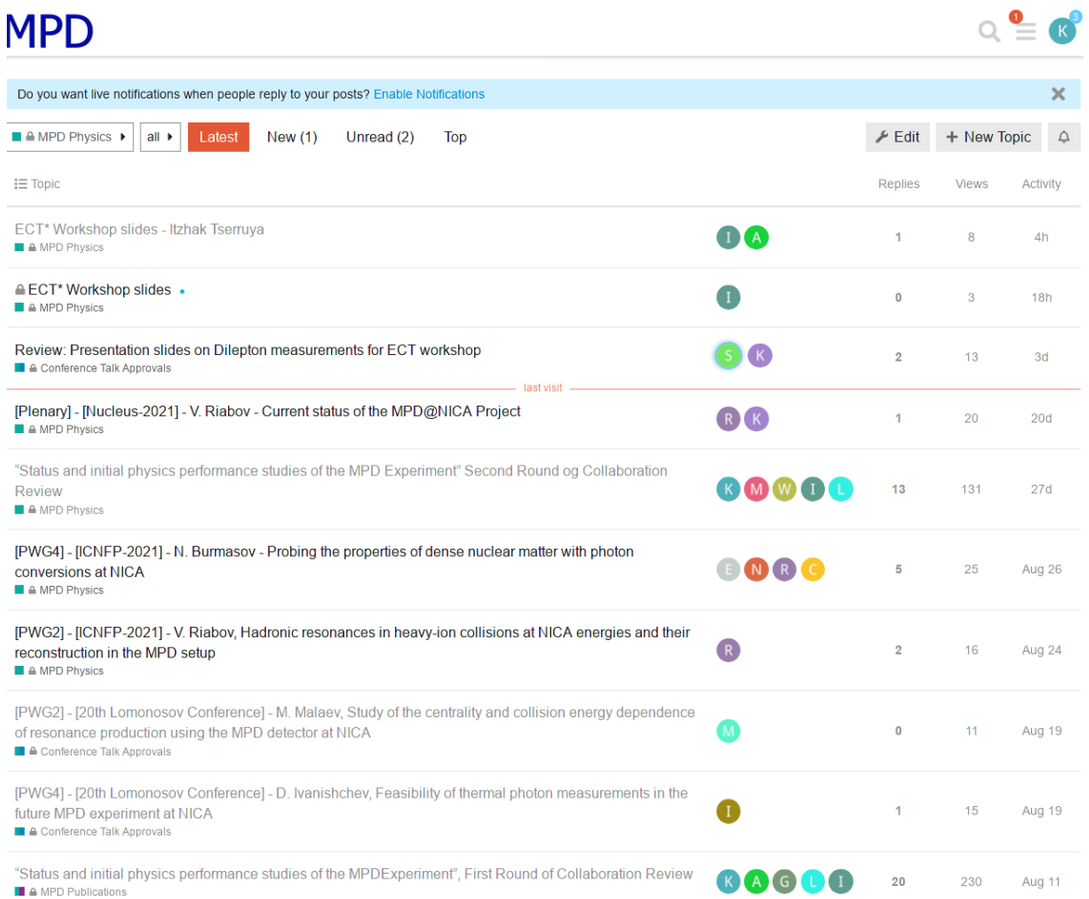
- Initial running plan for the NICA Accelerator, including beam species and collision energy has been recently discussed
- Large experience gained in preparation of the „MPD Status and Performance” manuscript
- Urgent need for an updated document with clear physics focus and consistent plan and message for „First Physics”
- Need to show up-to-date detector performance and relevant Monte-Carlo simulations, addressing recent theoretical developments
- Discussions on the draft started in Physics Council, each PWG is expected to provide input to the manuscript

Monte-Carlo simulations, computing readiness



- Regular productions of Monte-Carlo simulations, using MPD computing resources
- Requests can be made via Physics Working Groups
- Extensive new requests expected in response to clarification of initial NICA beams and in preparation for the next major publication on „First Physics in MPD”

MPD talks at major conferences



- Progress report for Particle Physics PAC, MPD DAC planned for 01.2022
- MPD status talk presented **SQM 2021**, **HADRON 2021**, **RHIC BES Seminar** as well as **RHIC BES program summary workshop**
- Rerular reports at major conferences (Nucleus 2021, ICT, ICNFP, Lomonosov ...)
- Rehearsals for major talks organized during MPD Physics Forum (Thursdays, 10 AM MST) – open to all Collaborators
- Possibility to organize rehearsals also for major seminars. Speakers should contact PWG convenors

Electronic tools for communication

- Resources being actively used by the Collaboration
  - General purpose mailing list: MPD_Coll_List(at)maillist.jinr.ru
  - The MPD Forum (based on the Discourse web forum platform) http://mpdforum.jinr.ru
  - Specific mailing lists for: Executive Council, Physics Council, Institutional Board, new lists can be created on request
  - The INDICO system (coupled to videoconference platforms) for planning, execution and archiving of MPD meetings
  - ZOOM, Volna system, WebEX, Vidyo systems for videoconferencing
- Resources in active development and being kept up to date:
  - General NICA webpage with MPD section: http://mpd.jinr.ru
  - MPD Software webpage: http://mpdroot.jinr.ru
  - „New" MPD-dedicated webpage: http://mpd.jinr.ru/experiment

IT resources for the MPD members

- Several IT resources are available to MPD members. To request access, a member **must** be on the MPD Collaboration List (members are added to the list on the request of the Group Leader)
  - Computing account at LIT (HybriLIT) – job submission, access to data, access to the DIRAC Infrastructure
  - Computing account at the NICA Cluster – job submission, access to data, including central Monte-Carlo productions
  - Account at the MPD Forum – place for internal MPD discussions
  - 50GB Private „cloud”: http://disk.jinr.ru (very useful for sharing large files)
- Other useful IT resources, available to all users
  - Account at the JINR INDICO (http://indico.jinr.ru)
  - Account in the Volna webconferencing system

Milestones of MPD assembling in 2020-2022

Year 2020

1. July 15th - MPD Hall and pit are ready to store and unpack Yoke parts
2. August - The first 13 plates of Magnet Yoke are assembled for alignment checks
3. Sept 15th - Oct 1st - Solenoid is ready for transportation from ASG (Italy)
4. November 10th - Solenoid arrived in Dubna
5. Nov-Jan - Assembling of Magnet Yoke at JINR

Year 2021

6. July-Aug - Solenoid installation into Iron Yoke and alignment
7. Aug - Dec - Electrical, pressure tests and vacuum tests
8. Nov –Dec - Assembling Iron yoke, Cryogenic platform and Cryostat, Vacuum test

Year 2022

9. Jan 17th -Mar - Liquid Nitrogen cooling
10. May - Cryogenic infrastructure ready
11. June-July - Cooling down to LHe temperature
12. July - Aug - Magnetic Field measurement
13. September - Installation of Support Frame.
14. Sept – Nov - Installation of TOF, TPC, Electronics Platform, Cabling
15. November - Installation of beam pipe, FHCal, Cosmic Ray test system
16. Nov - Dec. - Cosmic Ray tests
17. December - Commissioning

Year 2023

18. Jan + - Run on the beam

Interior of MPD Hall

Installation of the MPD Supercoducting coil inside the iron Magnet Yoke in MPD Pit
29 July 2021

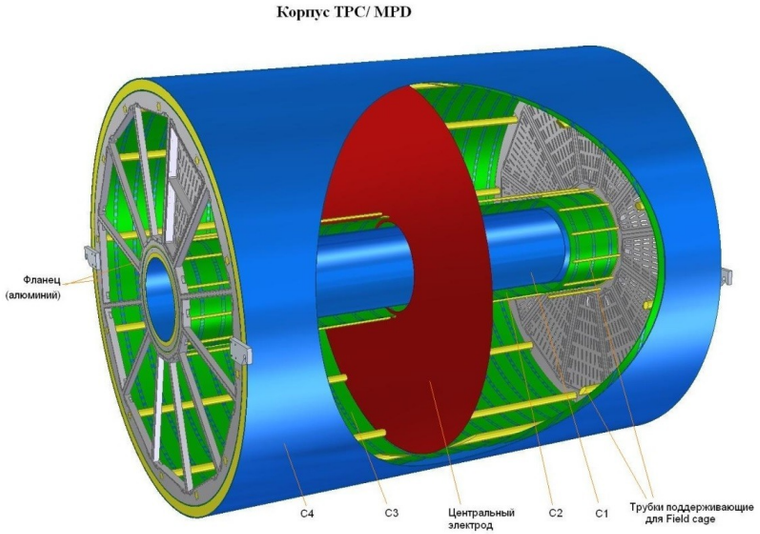
MPD Magnet installation procedure

Installation of the MPD Supercoducting coil inside the iron Magnet Yoke in MPD Pit ***29 July 2021***

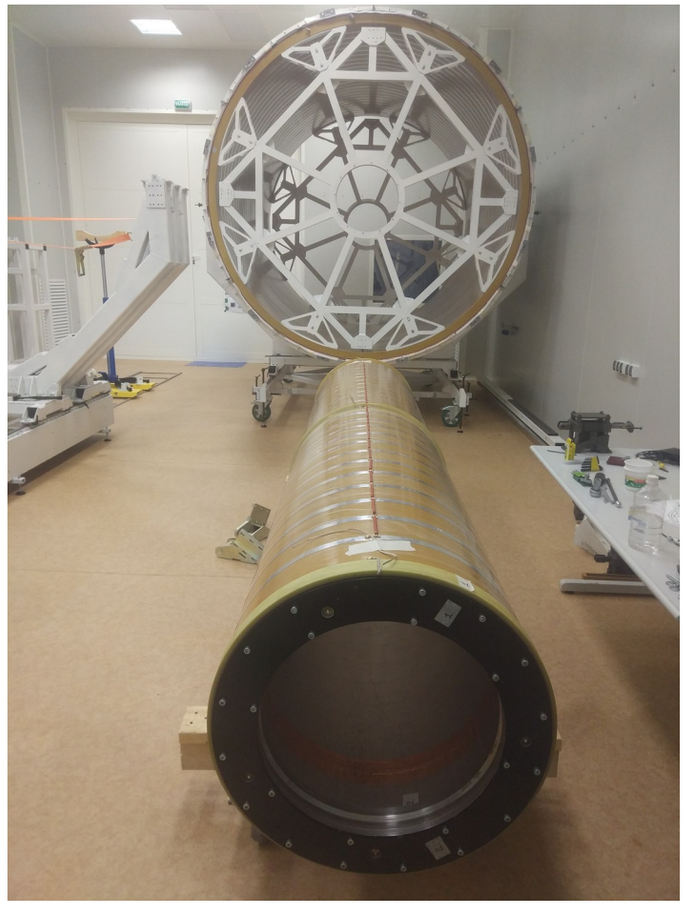
Critical milestone in the assembly of the full MPD apparatus

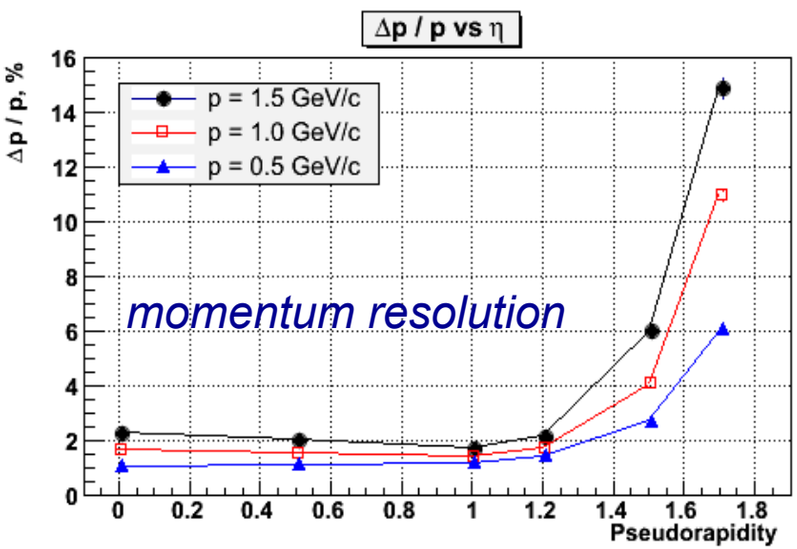
Now working on commissioning, cryogenic, electrical tests, before magnetic field measurement

Time Projection Chamber (TPC): main tracker

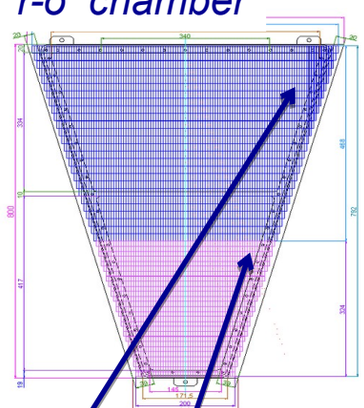


length	*340 см*
outer radius	*140 см*
inner radius	*27 см*
gas	*90%Ar+10%CH_4*
drift velocity	*5.45 см / μs;*
drift time	*< 30 μs;*
# R-O chamb.	*12 + 12*
# pads/ chan.	***95 232***
max rate	*< 7kHz (L=10^{27})*





r-o chamber



pad structure:
- *rows – 53*
- *large pads 5×18 mm²*
- *small pads 5×12 mm²*

FE electronics: **FEC64SAM** –
*dual **SAMPA** card (**ALICE** technology)*

Read-Out Chambers (ROCs) are ready and tested (production at JINR)
Electronics sets in production
Two sites (Moscow, Minsk) tested for electronics production
C1-C2 and C3-C4 cylinders assembled
TPC flange under finalization

MPD Time-of-Flight

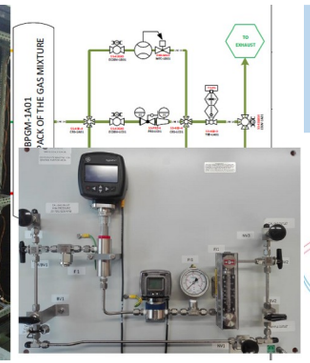
Mass production staff: 4 physicists, 4 technicians, 2 electronics engineers

Productivity: ~ 1 detector per day (1 module/2 weeks)

All procedure of detector assembling and optical control is performed in a clean rooms ISO class 6-7.

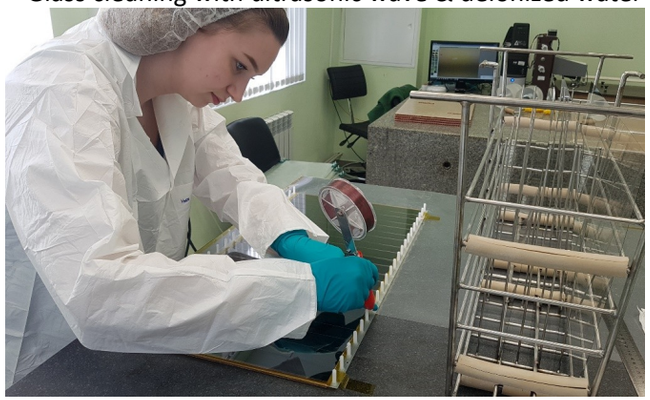
Glass cleaning with ultrasonic wave & deionized water

Automatic painting of the conductive layer on the glass



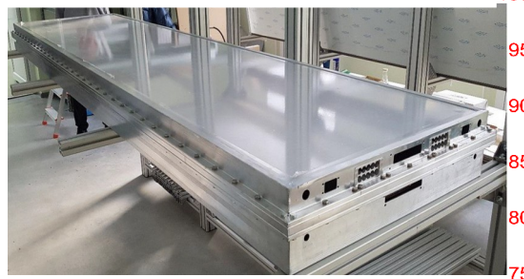
TOF gas system

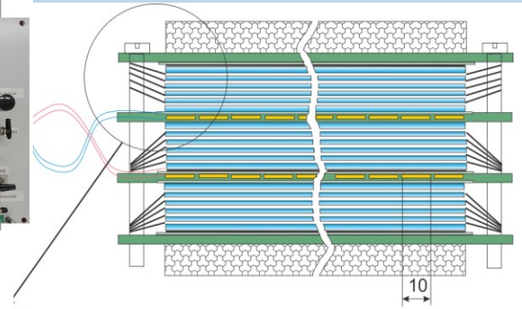
Dimensions of sensitive area
600 x300 mm²

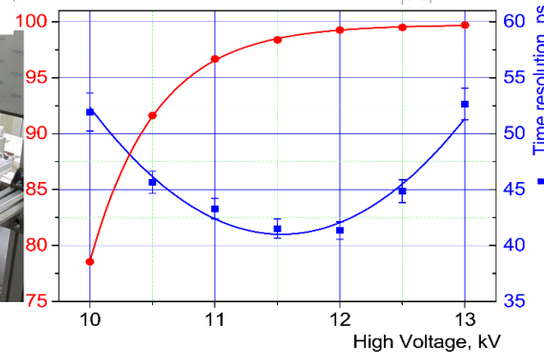


MRPC assembling

Soldering HV connector and readout pins







	Number of detectors	Number of readout strips	Sensitive area, m²	Number of FEE cards	Number of FEE channels
MRPC	1	24	0.192	2	48
Module	10	240	1.848	20	480
Barrel	280	6720	51.8	560	**13440** (1680 chips)

Single detector time resolution: 50ps

Purchasing of all detector materials completed

So far 40% of all MRPCs are assembled

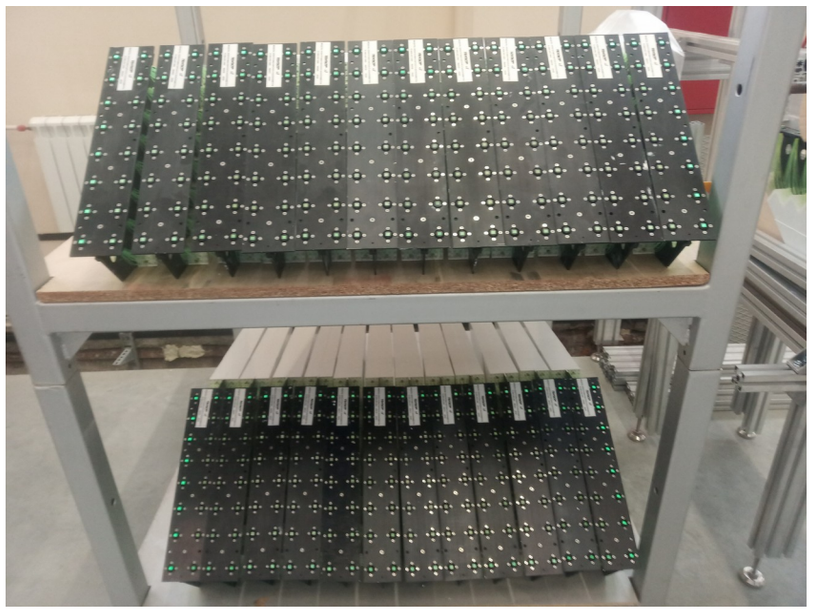
Assembled half sectors of TOF are under Cosmics tests

Investigation of solutions for detector integration and technical installations

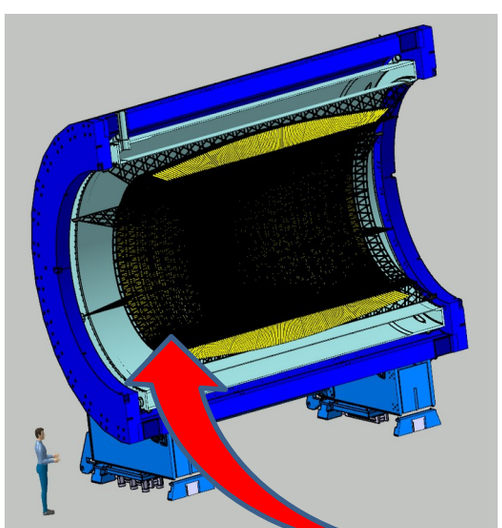
Electromagnetic Calorimeter (ECAL)

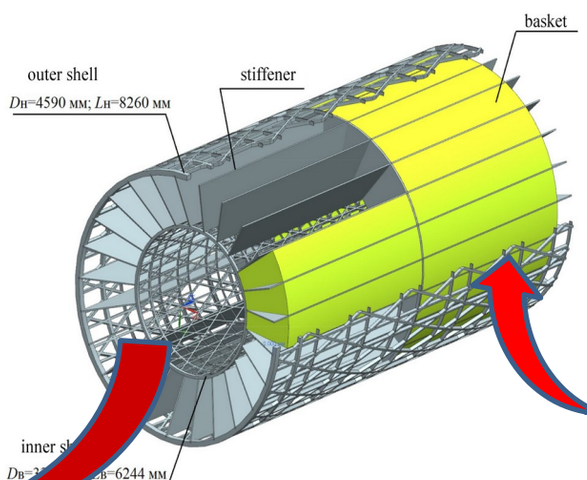
Barrel ECAL = <u>38400</u> ECAL towers (2x25 half-sectors x 6x8 modules/half-sector x 16 towers/module)

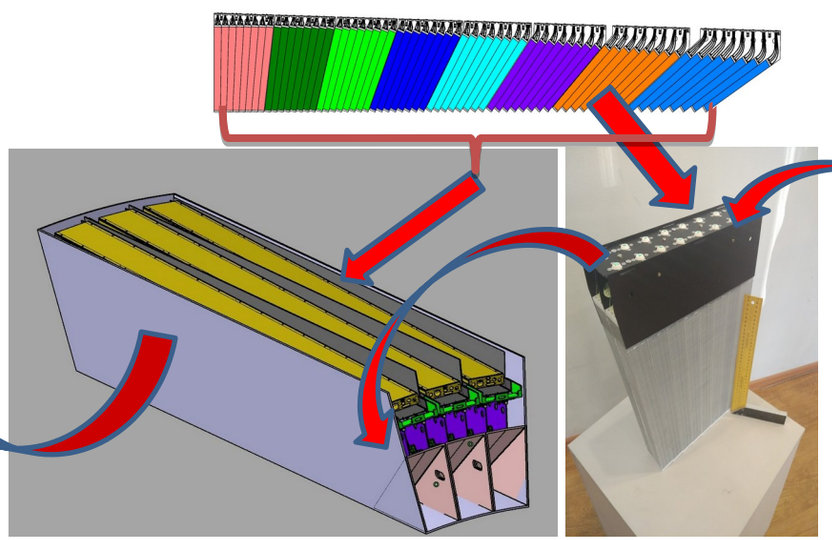
~**450** modules (16 towers each) = 4 sectors produced
400 modules – production started, finish by the end of Mar 2022
Sectors assembling procedure under development.
Mass assembling of ECal sectors start - October 2021
Up to 12 sectors should be ready in 2022



Sectors in dedicated Containers







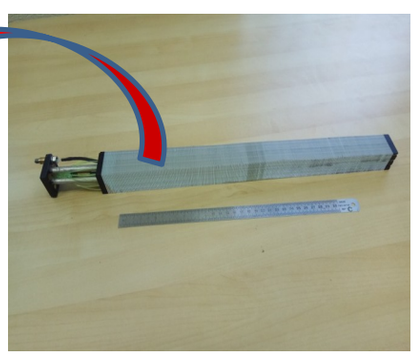
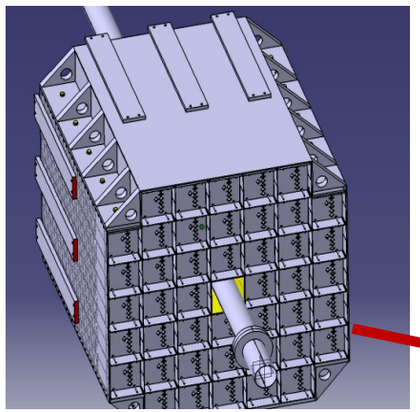
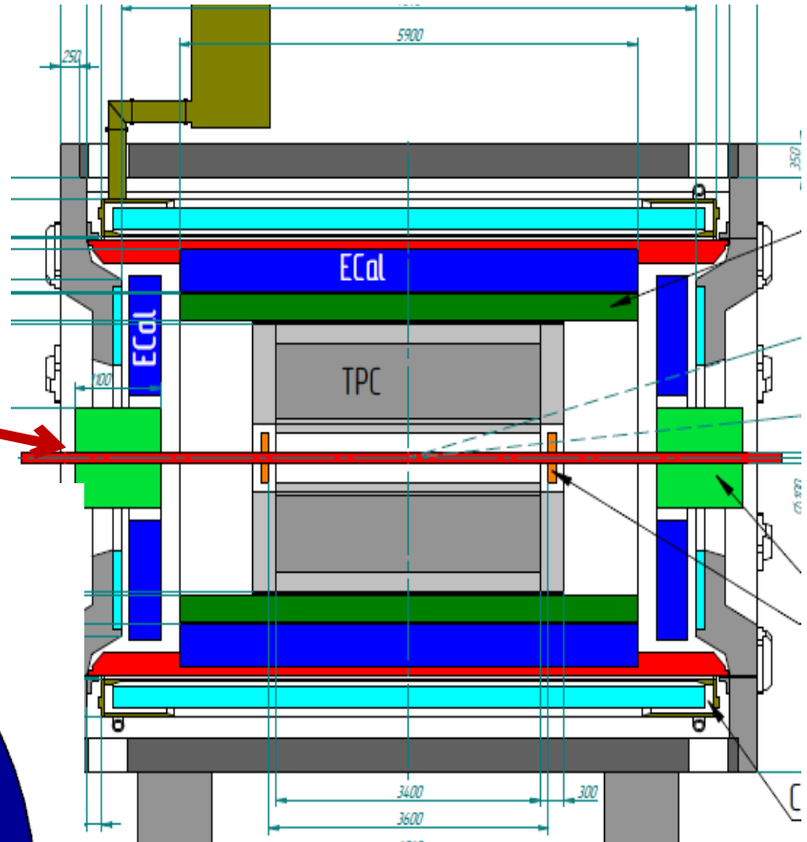


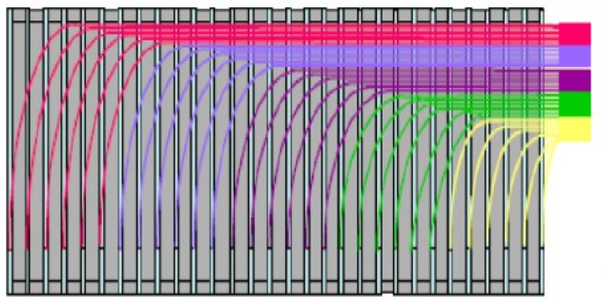
Photo of one element

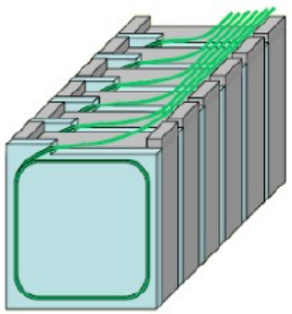
Pb+Sc "Shashlyk" ; read-out: WLS fibers + MAPD; L ~35 cm (~ 14 X_0); Segm. (4x4 cm^2); σ(E) ~ 5% @ 1 GeV; time res. ~500 ps

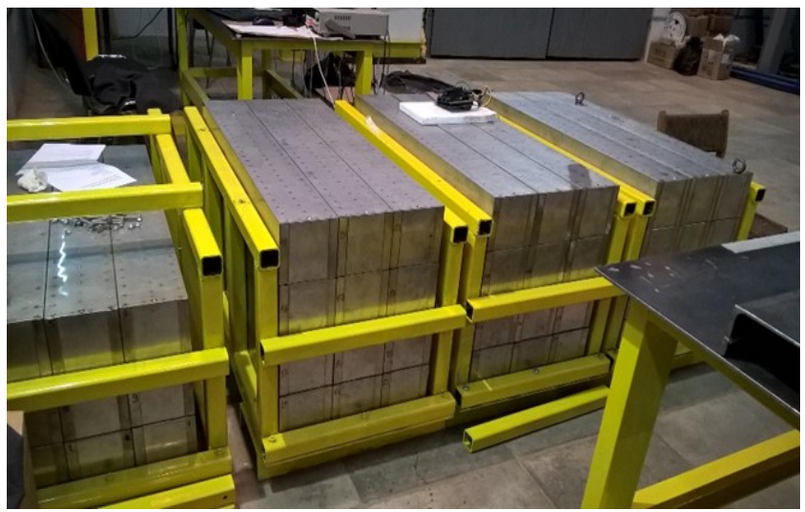
Forward Hadron Calorimeter (FHCal)

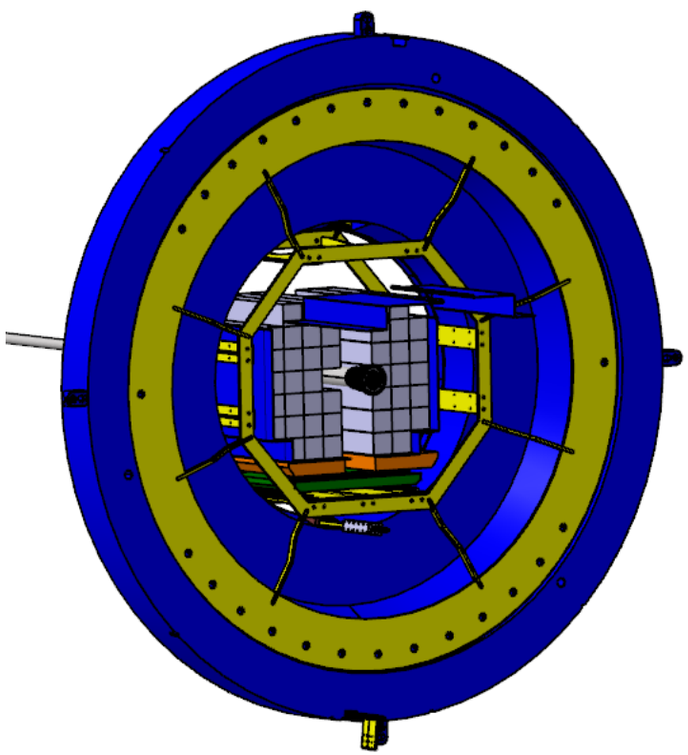






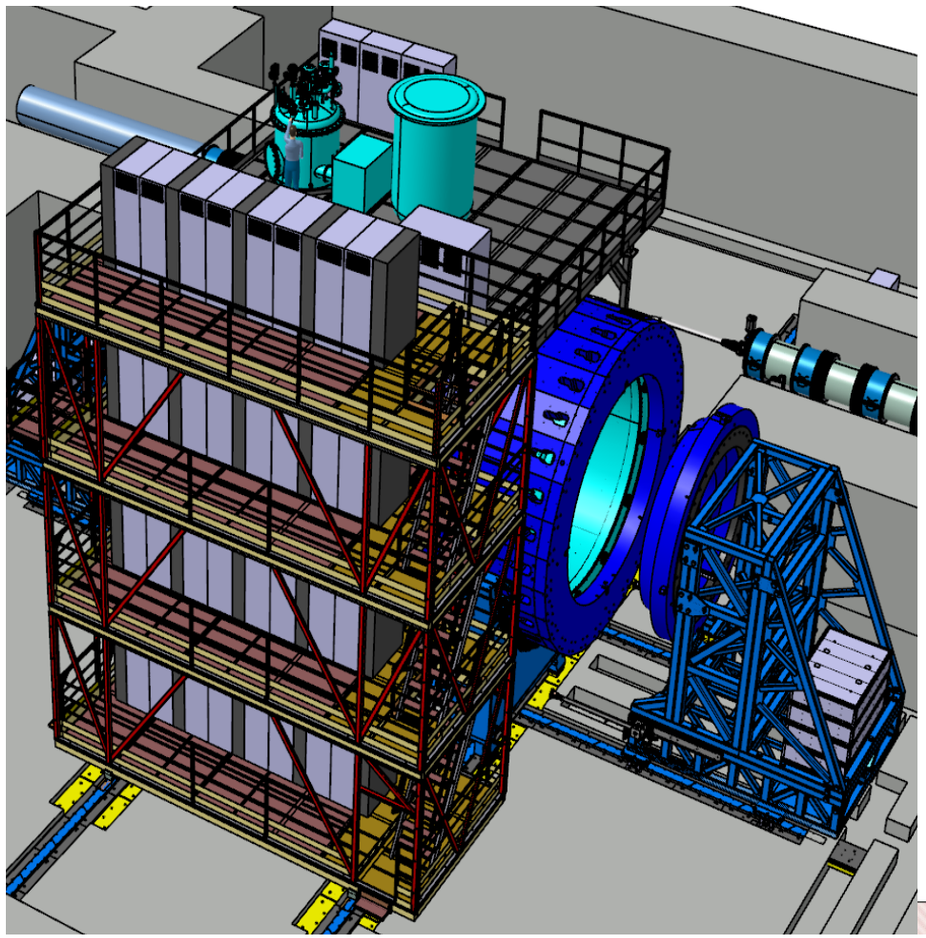


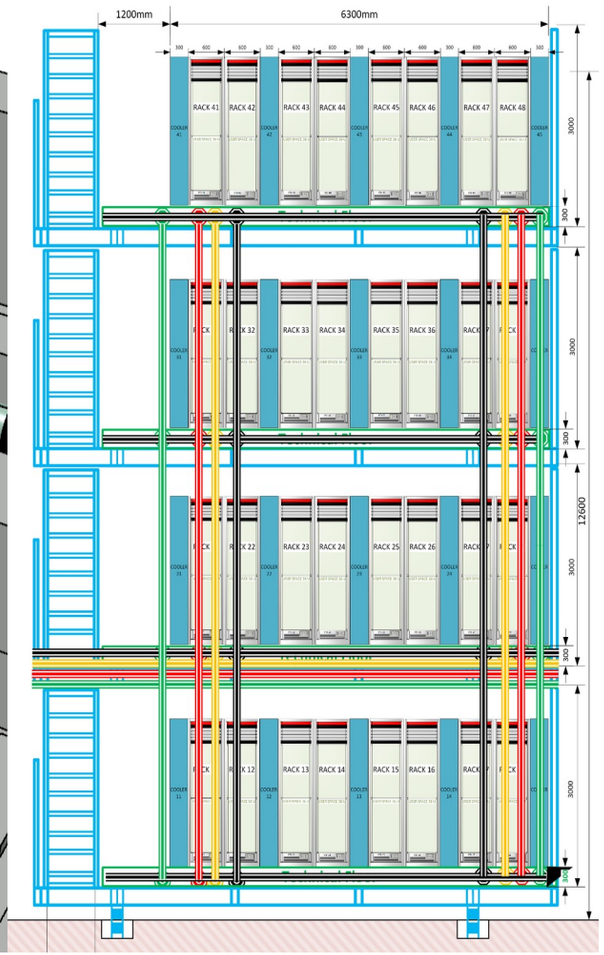




- **Two-arms at ~3.2 m from the interaction point.**
- **Each arm consists of 44 individual modules.**
- **Module size 150x150x1100cm³ (42 layers)**
- **Pb(16mm)+Scint.(4mm) sandwich**
- **7 longitudinal sections**
- **6 WLS-fiber/MAPD per section**
- **7 MAPDs/module**

NICA-MPD-Platform for Electronics



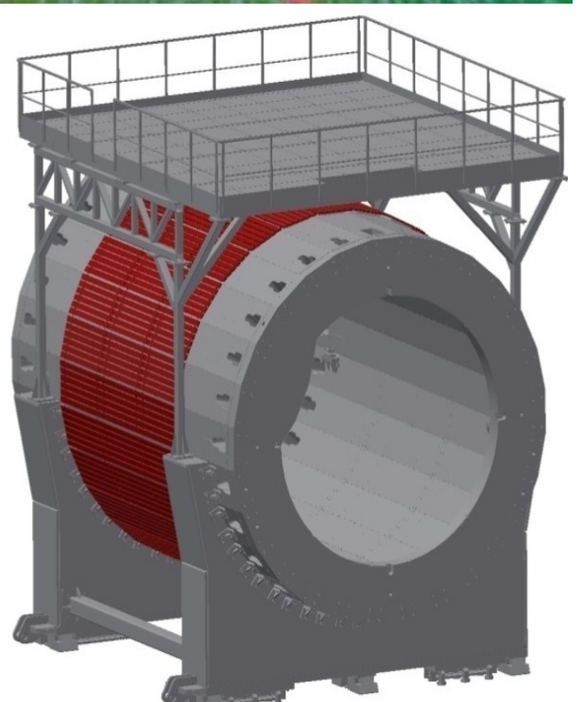


NICA-MPD-Platform is a contribution of the Polish groups to MPD

M. Peryt (WUT) K. Rosłon (WUT)

- Electronics platform has 4 levels with 8 racks on each level, each Rack provides cooling, fire safety and radiation monitor
- Cable ducts connect detectors inside of MPD and Electronics Platform
- Recent progress: the full design documentation of the NICA-MPD-Platform has been delivered to JINR, negotiations ongoing for contract to construct and install equipment
- The mechanical part of the Platform is delivered to MPD Hall, first two levels of the Platform installed in place

MPD Cosmic Ray Detector (MCORD)



NCBJ, Świerk - WUT, Warsaw – UJK, Kielce (Poland) 18 scientists+12 engineers

Project leaders: Ł. Świderski, M. Bielewicz (NCBJ)

As soon as possible - start tests of MPD subsystems before Collider operation

Cosmic Ray Detector required for Commissioning and tests of the MPD.

The signals from MCORD will be used for TPC and TOF tests after their installation.

First MCORD modules delivered to JINR on October 8th 2021

CDR for MCORD approved by the MPD DAC

Cosmic Ray Detector consists of plastic scintillators with SiPM (Phototubes) light converters

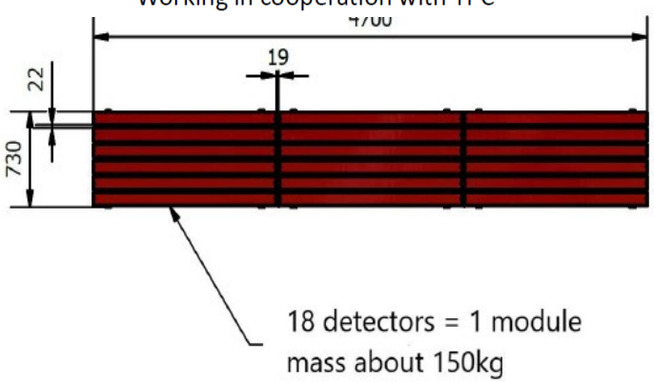
a) Trigger (for testing or calibration)
- testing before completion of MPD (testing of TOF, ECAL modules and TPC)
- calibration before experimental session

b) Veto (normal mode - track and time window recognition) Mainly for TPC and eCAL

Additionally

c) Astrophysics (muon shower and bundles)
- unique for horizontal events

Working in cooperation with TPC



5. MCORD Detector

SCINTILLATORS

Number of scintillators:	660 pcs
Dimensions of scintillators:	95x25x1500 [mm]
Dimensions of detector:	100x30x1554 [mm]
Scintillators are placed in the rectangle profile	10x30x2.5 [mm]
Weight of detector:	6.5 kg
Material of scintillators casing:	Aluminum alloy

MODULES

Number of detector in one module:	18
Number of Modules:	28
Dimensions of module:	730x90x4700 [mm]
Weight of one module:	150 kg

SiPM/MMPC

Number of SiPMs (Chanels)	1320
Number of SiPMs (with two fibers)	2640

RESOLUTION

Position resolution: In X axis – up to 5 cm, In Y axis – 5-10 cm

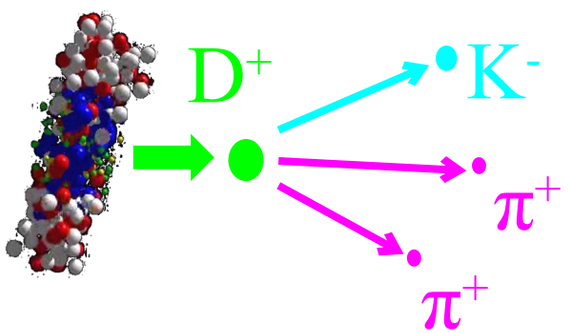
Time Resolution – about 300-500 ps

Number of events (particles): about 100-150 per sec per m2

Calculated Coincidence factor: about 98%

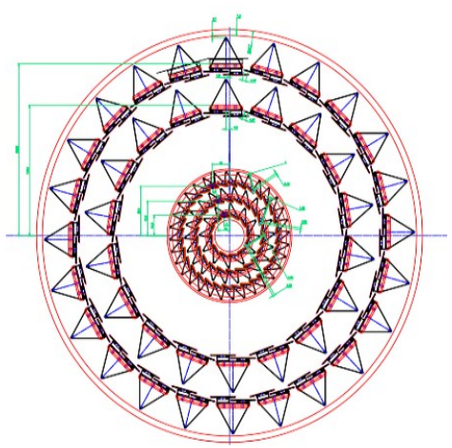
Inner Tracker System (ITS): precise tracking

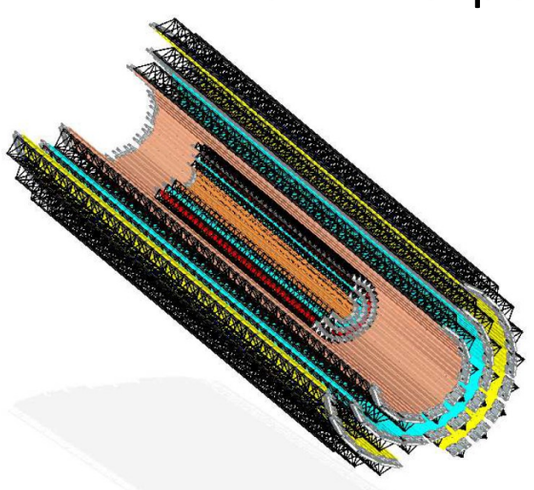
Consortium includes JINR, NICA (BM@N & MPD) , **FAIR, Russian, Polish and Ukrainian Institutes + CCNU Central China Normal Univ., IMP- Institute of Modern Physics, USTC – Hefei**



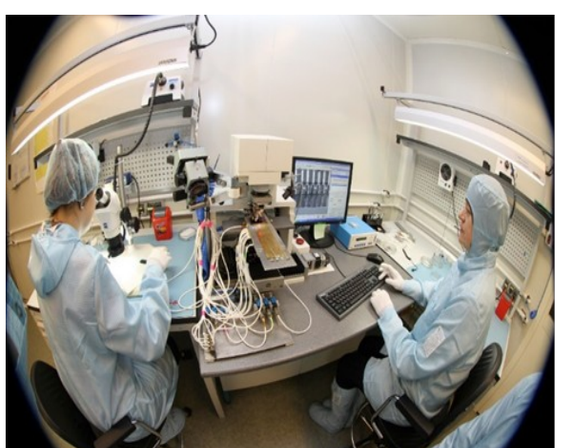
Protocol # 134 between CERN and JINR states the legal terms for transaction of CERN developed novel technology and the know-how for building the MPD-ITS on the basis of Monolithic Active Pixel Sensors *(the **MAPS***) ALPIDE, signed in 2018. This document laid a clear road towards the MPD ITS.

ITS TDR expected for MPD DAC in January 2022



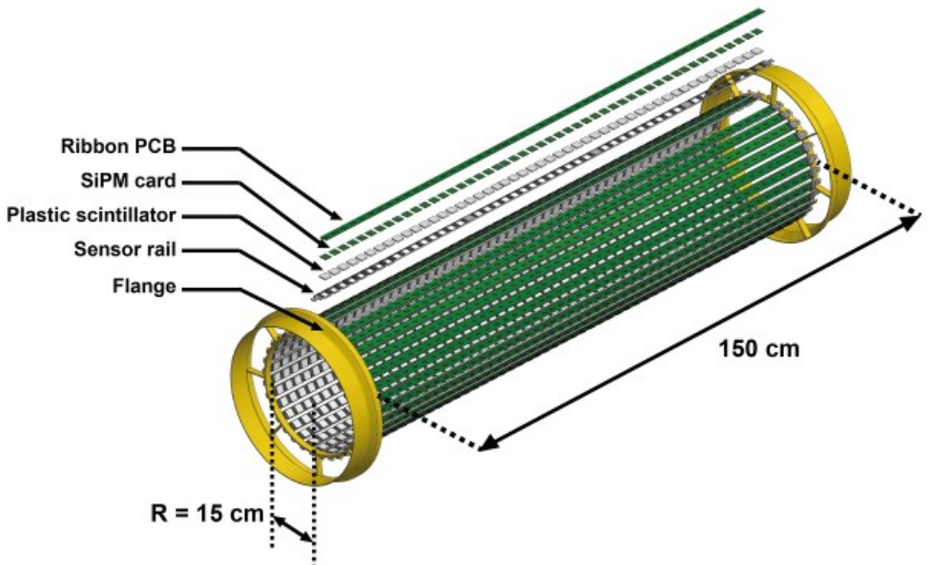


MPD ITS based on ALICE type staves



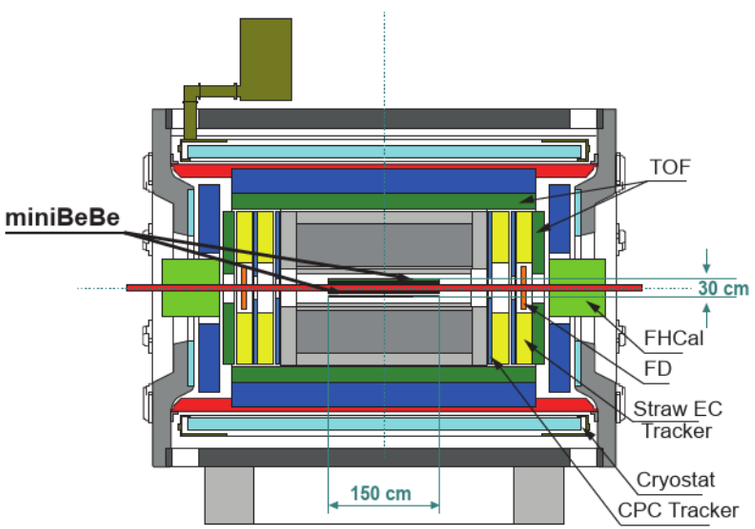
MiniBeBe (Mini Beam-Beam Counter)

MexNICA Collaboration



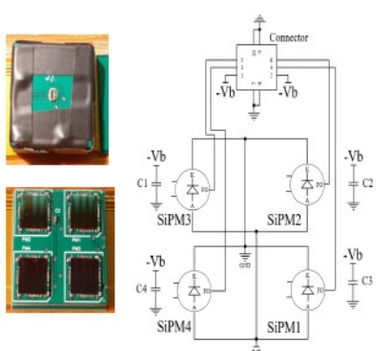
Main requirement:

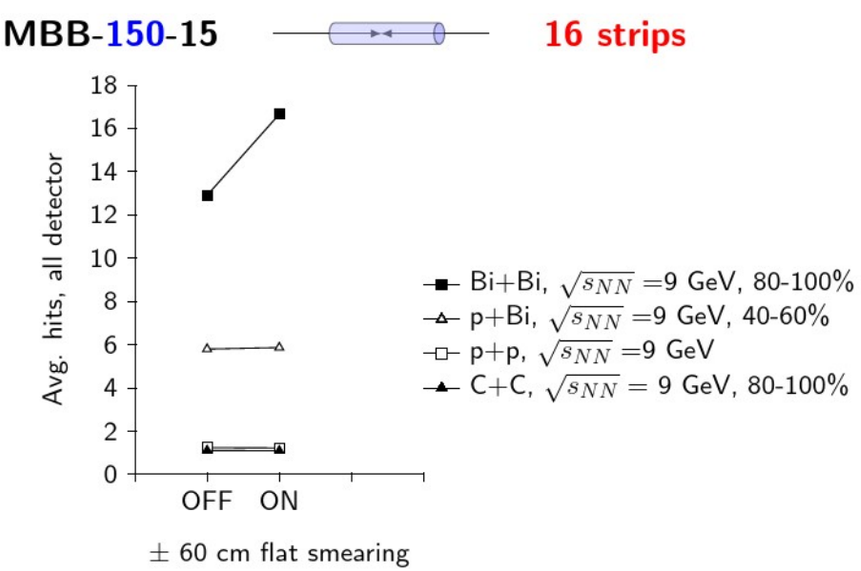
- Provide fast wake-up signal for TOF and reference time for TOF measurement with time resolution of ~30 ps
- Improve trigger efficiency for p+p, p-A and low multiplicity A-A
- Provide possibility to perform luminosity measurements at Phase 0 of NICA operation
- Presentation of MiniBeBe progress expected at MPD DAC in January 2022



Basic cell with four SiPMs & electronics

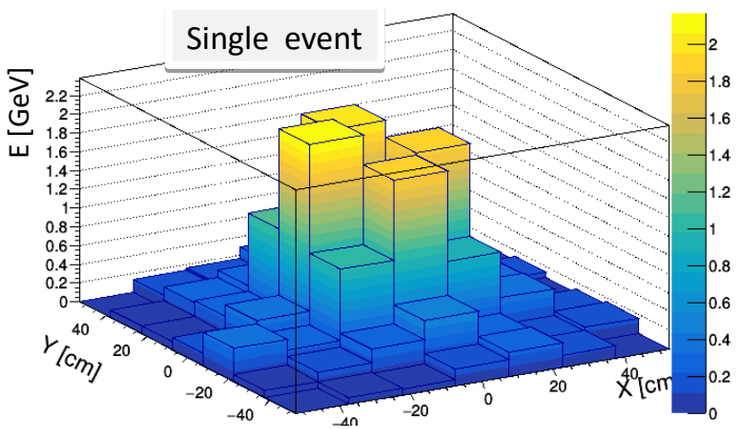
- 20x20 mm²
- 4 SiPMs card attached to BC404 plastic scintillator
- Fast outputs to "connector" (micro mezzannine)
- DC decoupling capacitors

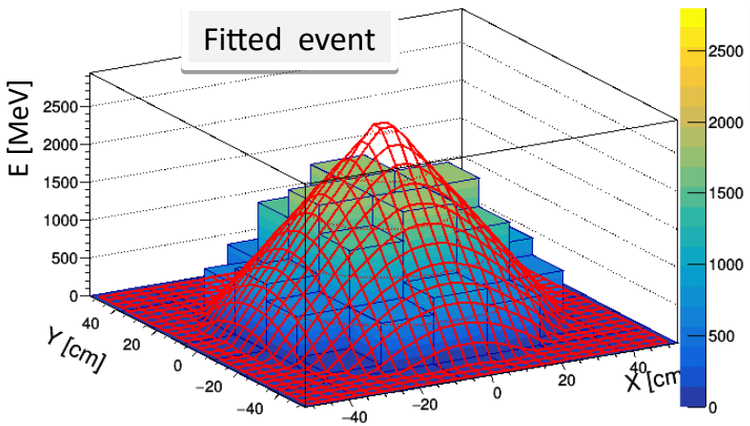




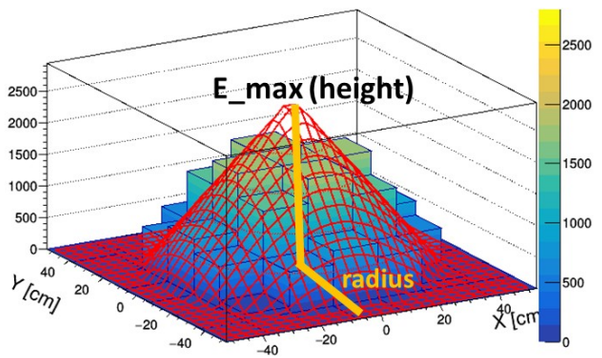
Centrality and reaction plane in FHCal

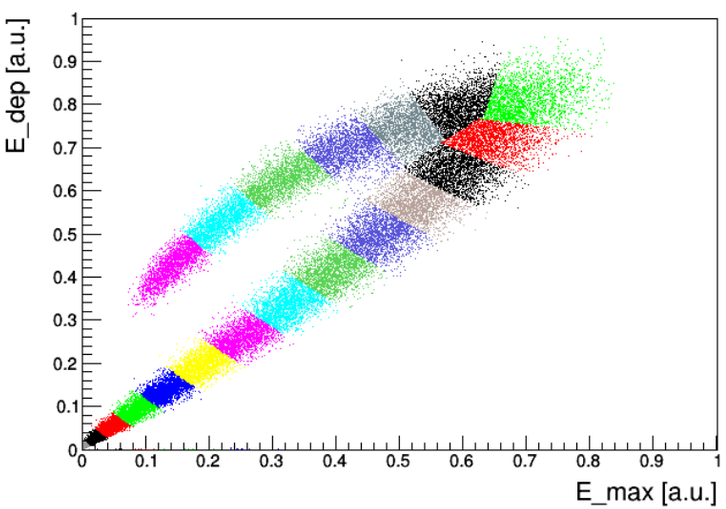
Energy distribution in FHCal modules



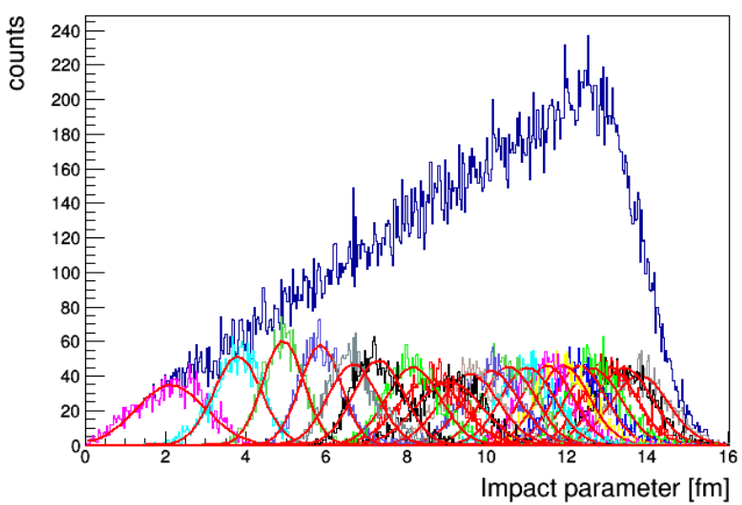


Initially we have experimental energy deposition E_{dep} in FHCal.

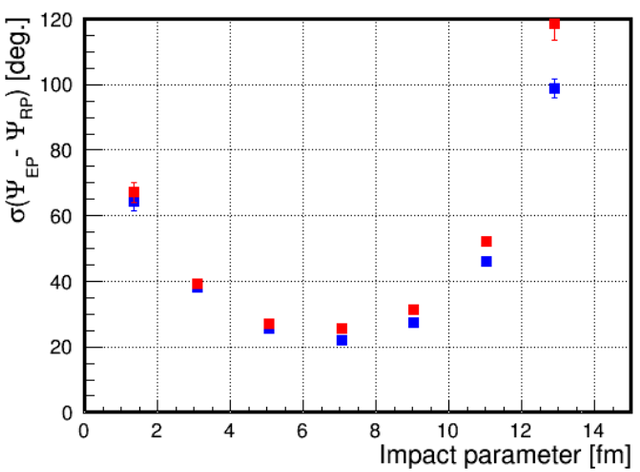




Each color bin is 5% fractions of the total number of events.



Centrality resolution



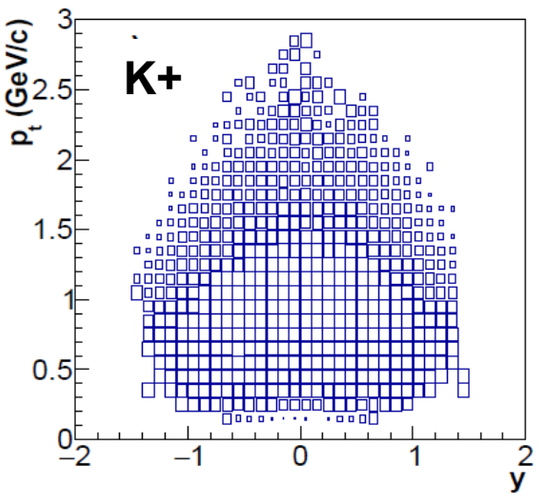
Reaction plane resolution

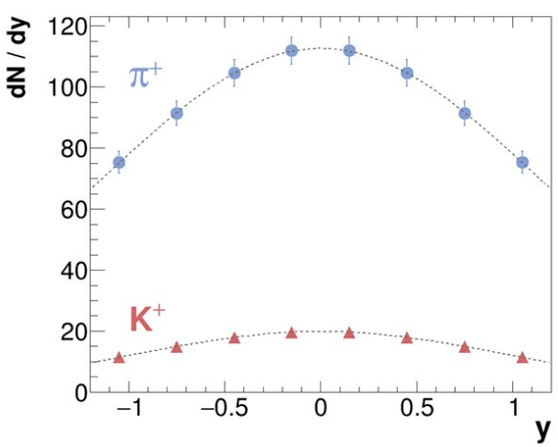
Hadroproduction with MPD

- **Particle spectra, yields & ratios are sensitive to bulk fireball properties and phase transformations in the medium**
- **Uniform acceptance and large phase coverage are crucial for precise mapping of the QCD phase diagram**

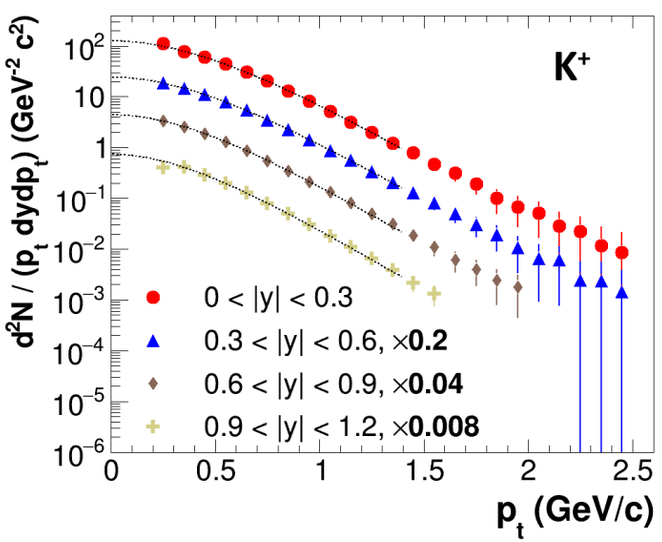
✓ *0-5% central Au+Au at 9 GeV from the PHSD event generator, which implements partonic phase and CSR effects*

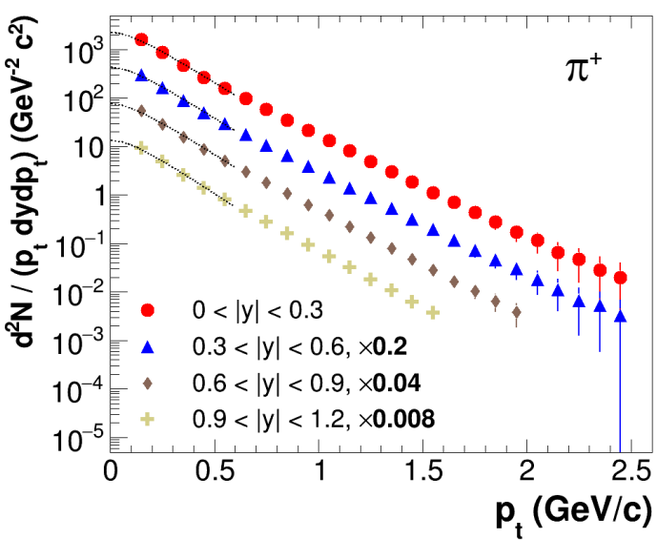
✓ *Recent reconstruction chain, combined dE/dx+TOF particle ID, spectra analysis*





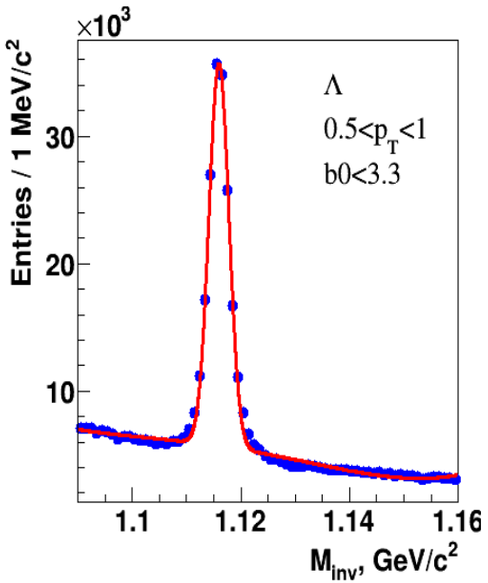
- MPD provides large phase-space coverage for identified pions and kaons (> 70% of the full phasespace at 9 GeV)
- Hadron spectra can be measured from p_T=0.2 to 2.5 GeV/c
- Extrapolation to full p_T-range and to the full phase space can be performed exploiting the spectra shapes (see BW fits for p_T-spectra and Gaussian for rapidity distributions)

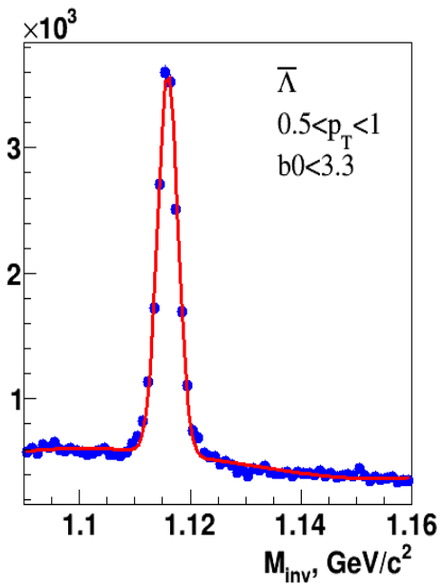


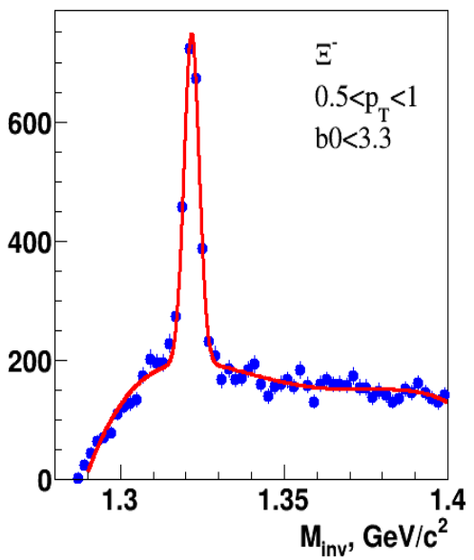


Strange and multi-strange baryons

Stage'1 (TPC+TOF): Au+Au @ 11 GeV, PHSD + MPDRoot reco.





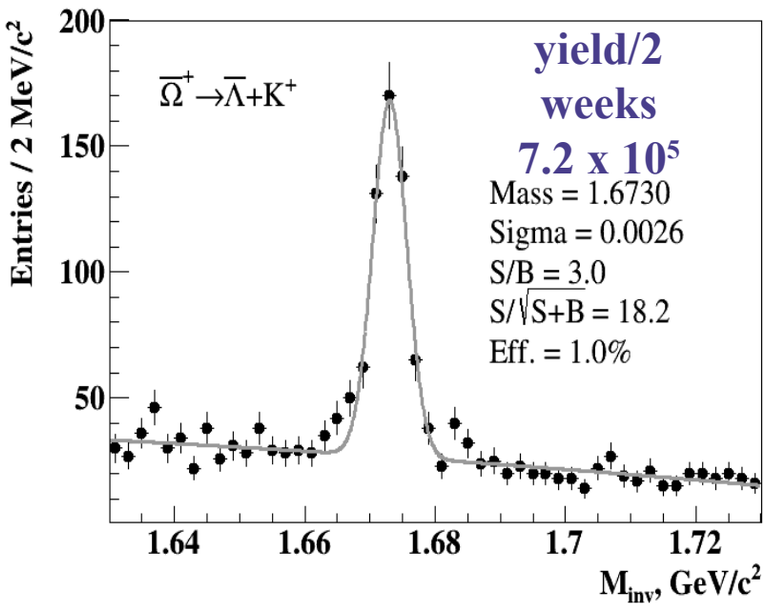


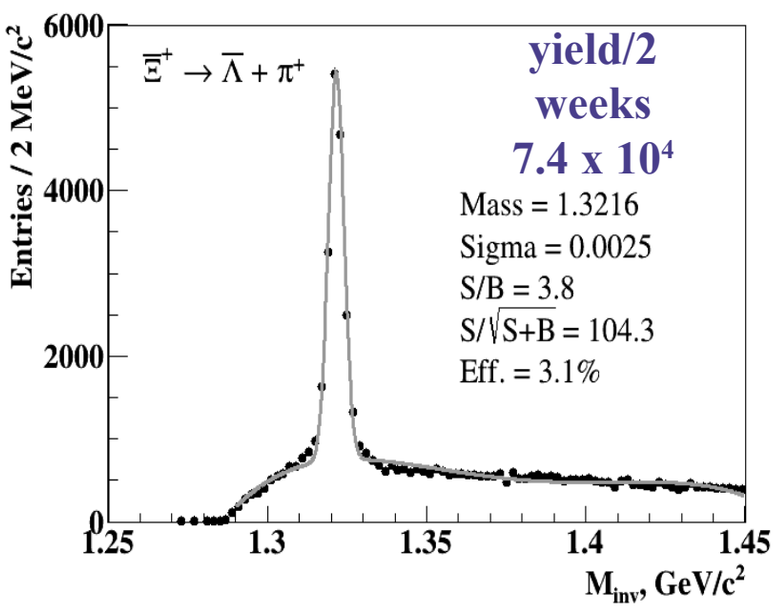
Detailed p_T spectra for hyperons in multiple centrality intervals

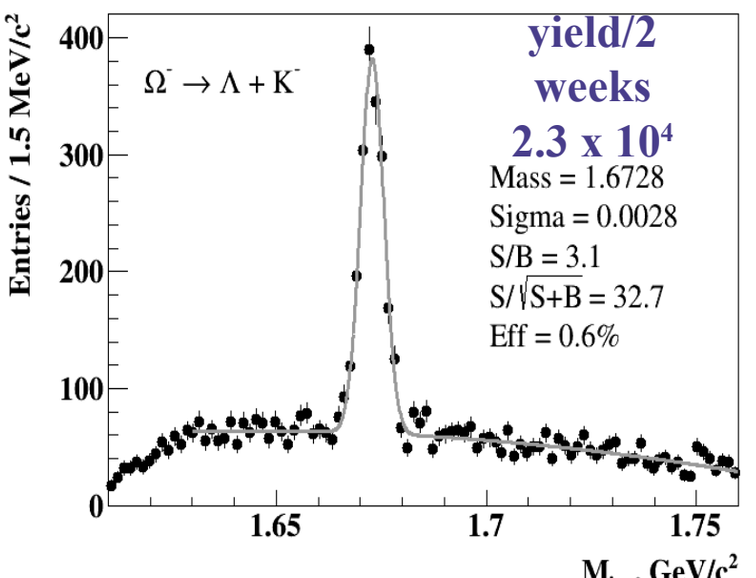
Large and consistent acceptance

Clean signal enhanced by good PID

Significant yield of rare hyperons



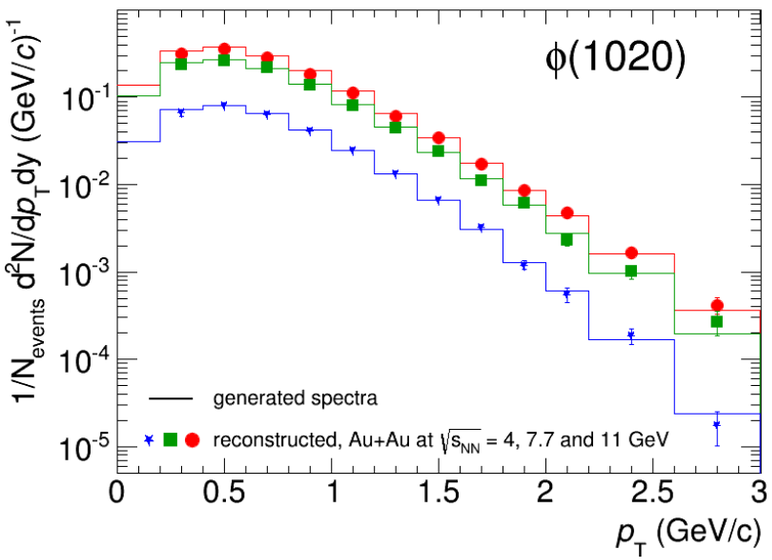




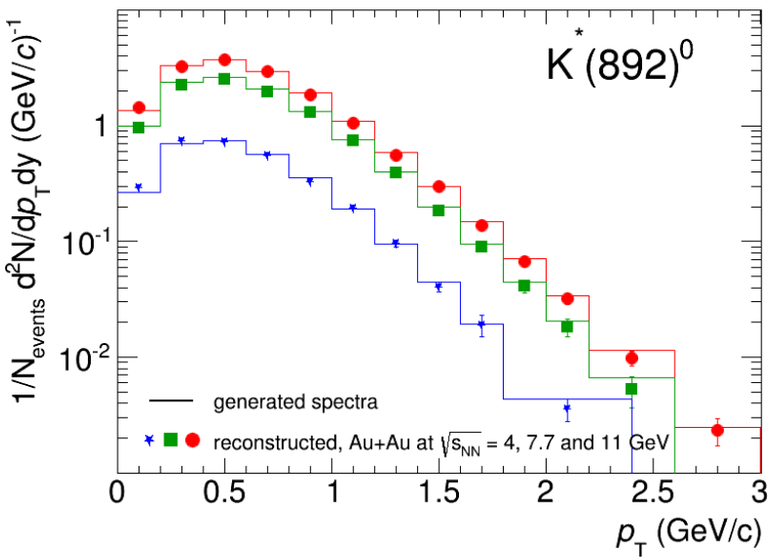
Resonances at MPD

· Minbias Au+Au@11 (UrQMD) · Full reconstruction and realistic PID · Topology cuts and secondary vertex · Event mixing for background

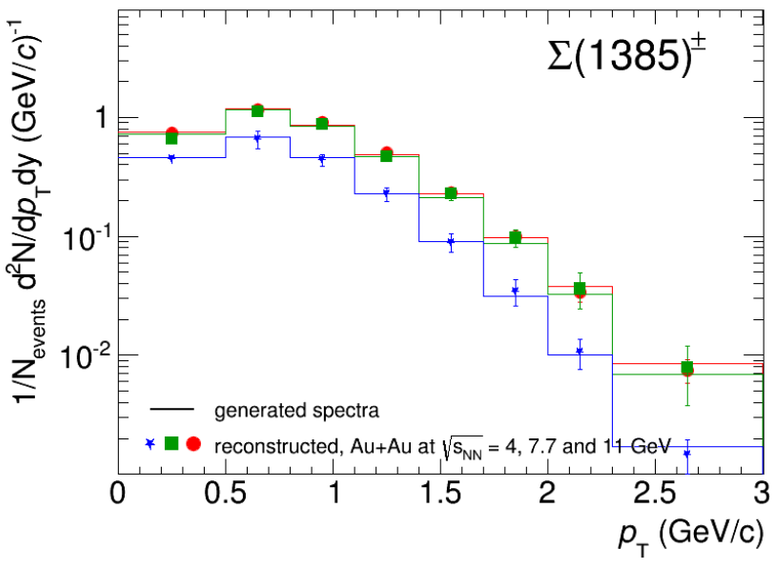
$\phi(1020) \rightarrow K^+K^-$



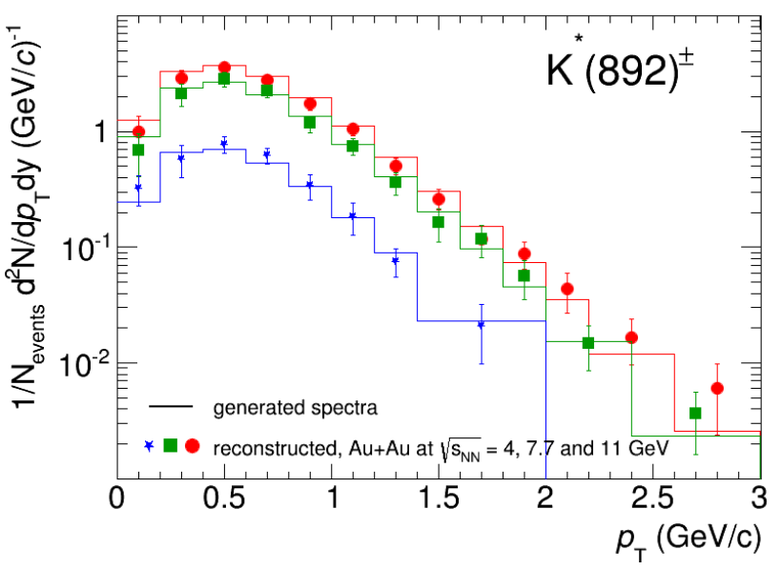
$K^*(892)^0 \rightarrow K^{\pm}\pi^{\pm}$



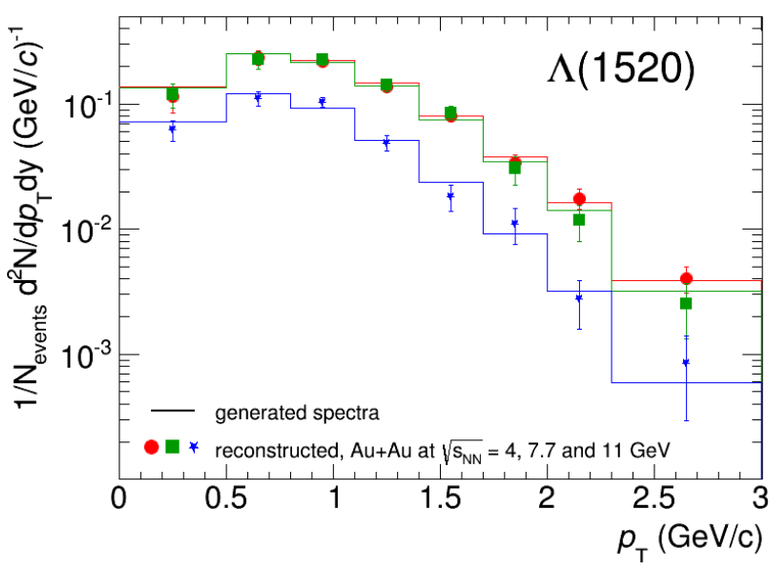
$\Sigma(1385)^{\pm} \rightarrow \pi^{\pm}\Lambda\ (\Lambda \rightarrow p\pi)$



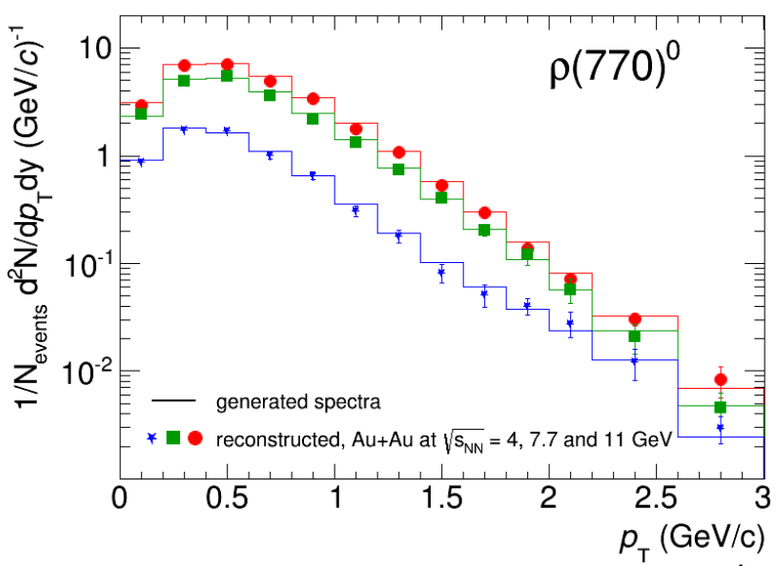
$K^*(892)^{\pm} \rightarrow \pi^{\pm}K_s\ (K_s \rightarrow \pi^+\pi^+)$



$\Lambda(1520) \rightarrow pK^-$

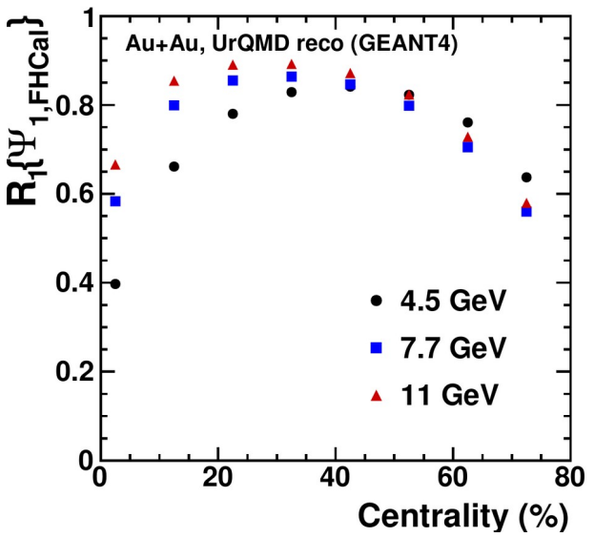


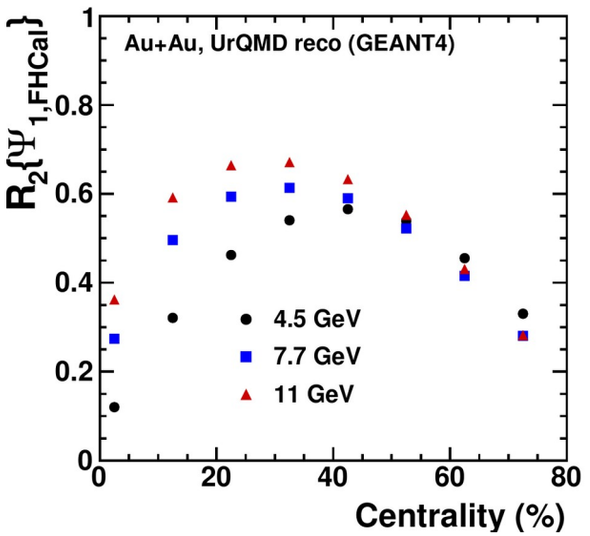
$\rho(770)^0 \rightarrow \pi^{\pm}\pi^{\pm}$

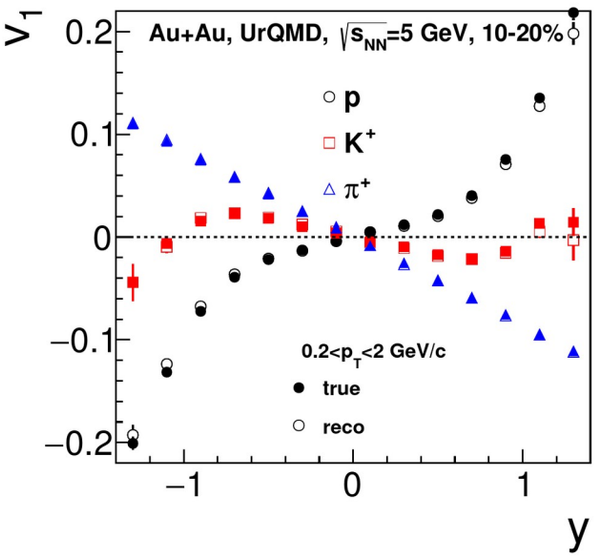


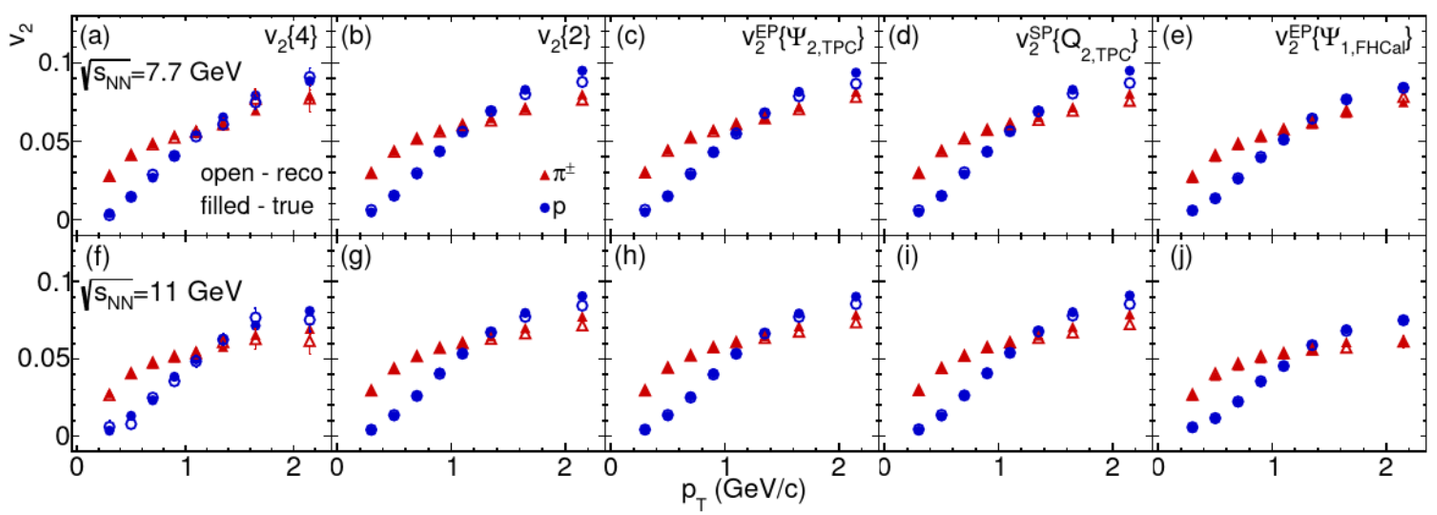
Performance of collective flow studies

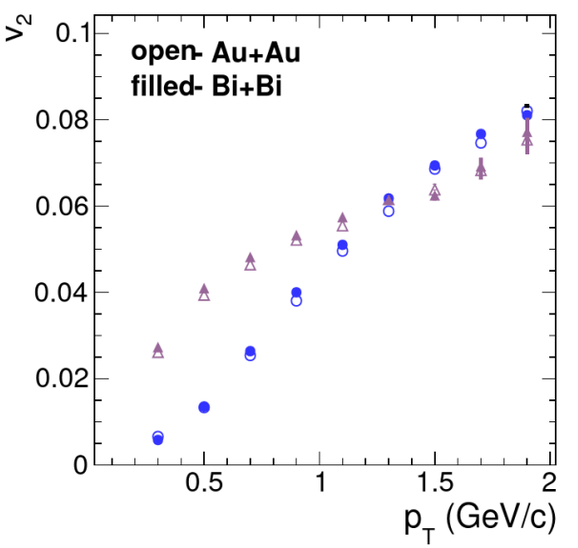
Au+Au, $\sqrt{s_{NN}}$ = 4.5, 7.7, 11 GeV, UrQMD, GEANT4 + MPDRoot reco.







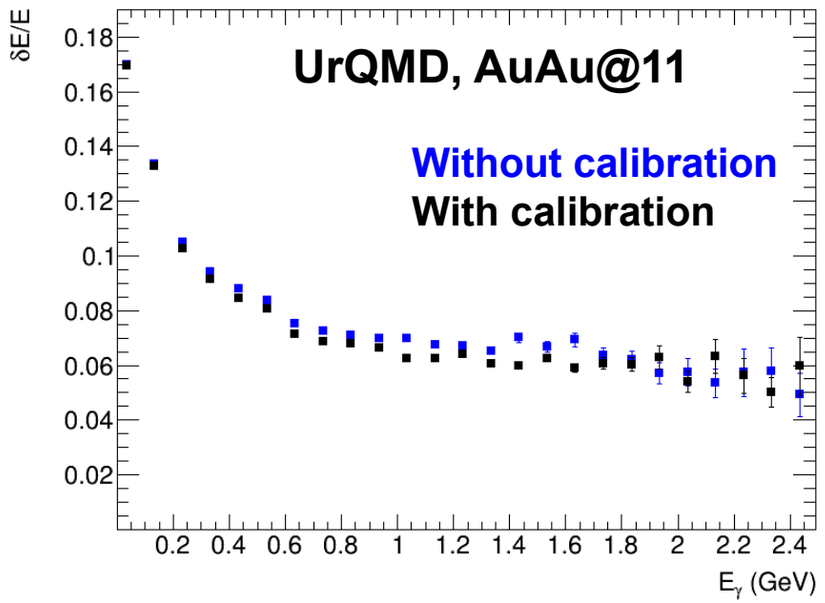


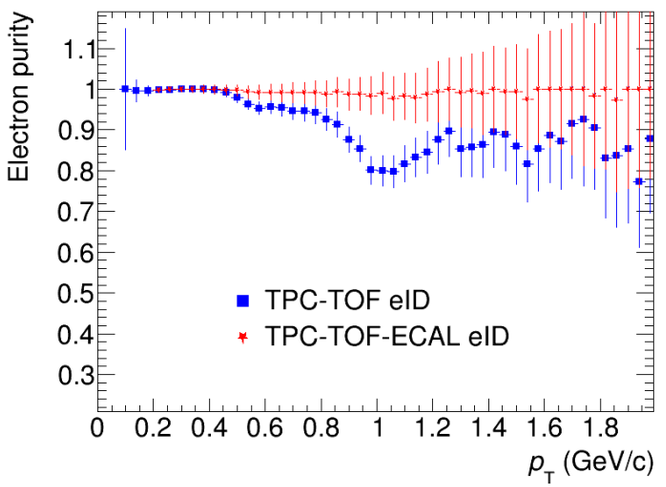


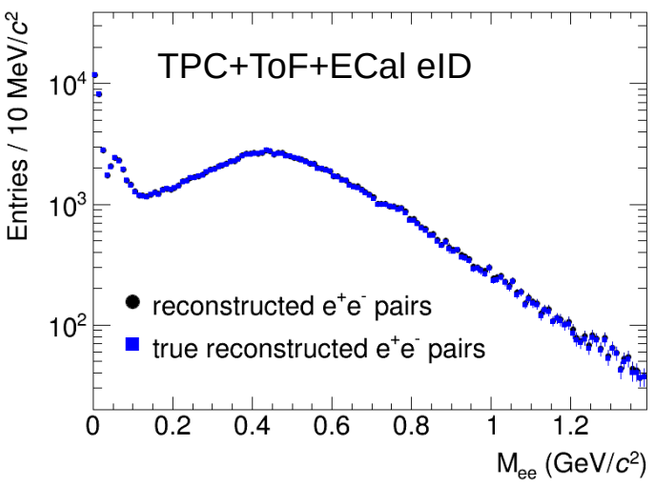
Collective flows a unique and direct way to probe EOS of QCD matter. Excellent flow measurement capabilities in MPD

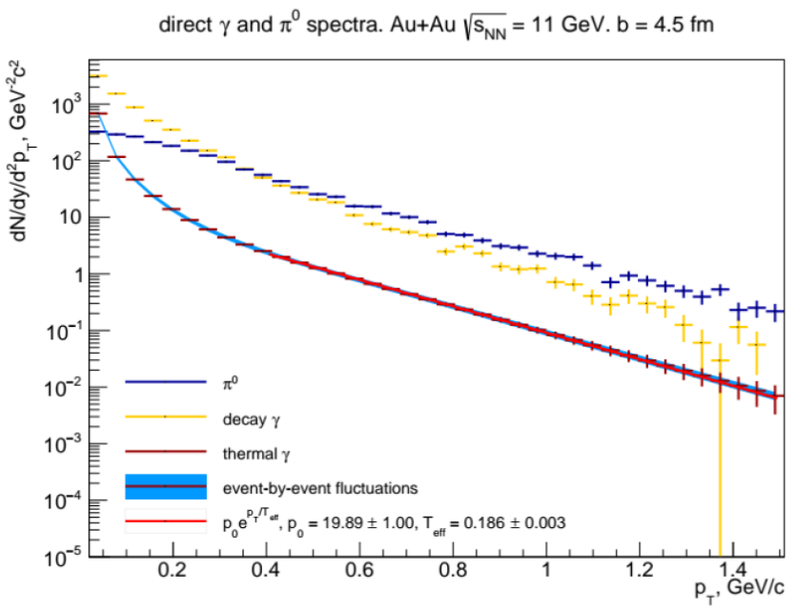
Electromagnetic probes in ECAL

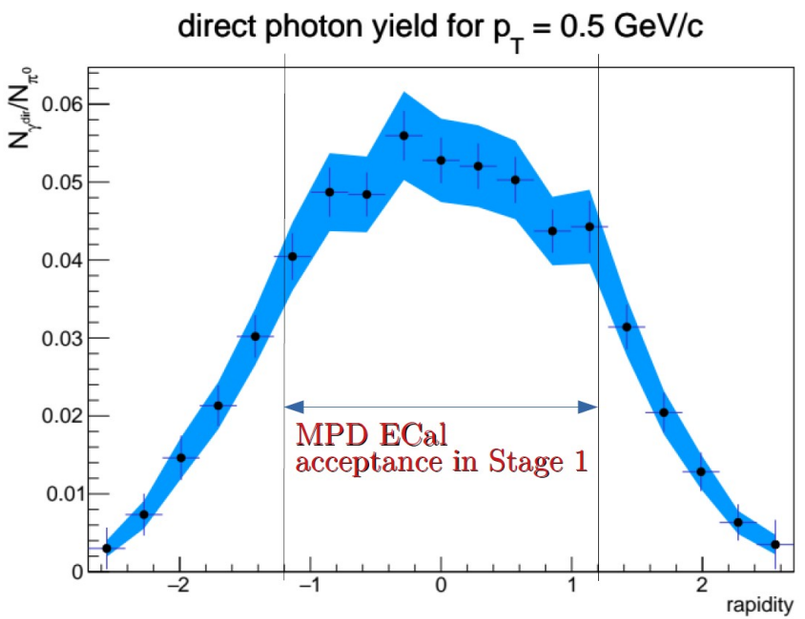
- Realistic ECAL reconstruction & analysis – large acceptance ECAL with good energy resolution: ideal tool for measurement of neutral mesons in a wide momentum range











- Important feasibility cross-checks for di-leptons

- Promising feasibility studies for prompt photon measurements in MPD

Summary

- Increased effort on the preparation of the MPD Physics Programme, with connection to detector readiness
- Definition of formal deadlines for MPD project milestones
- MPD recognition in global heavy-ion physics landscape
- All components of the MPD 1st stage detector advanced in production, commissioning expected for 2022