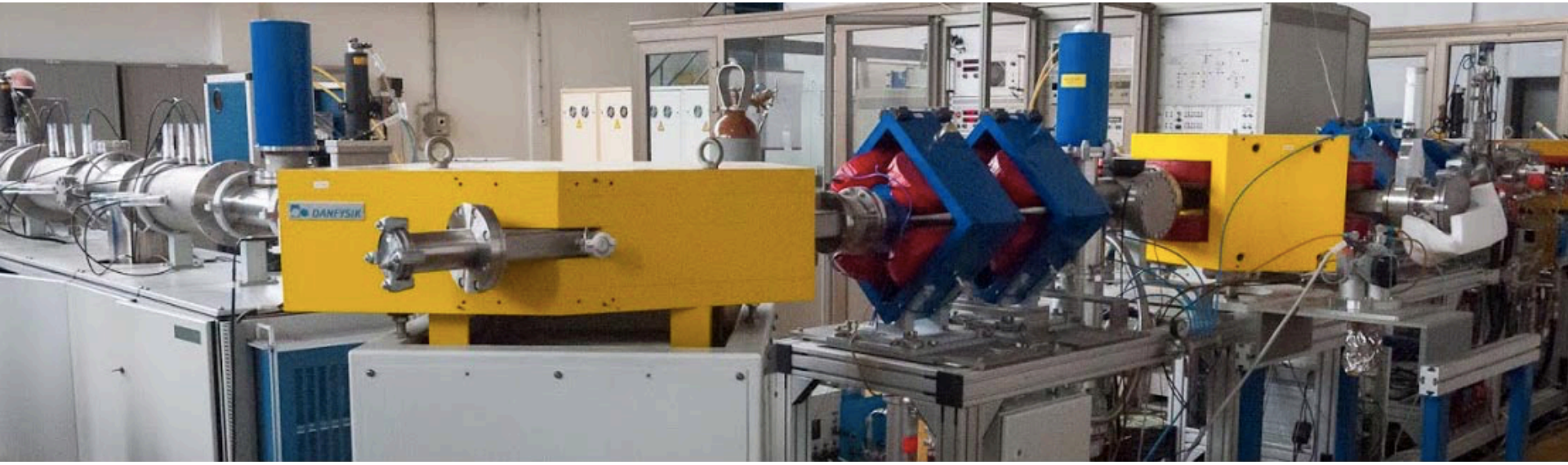
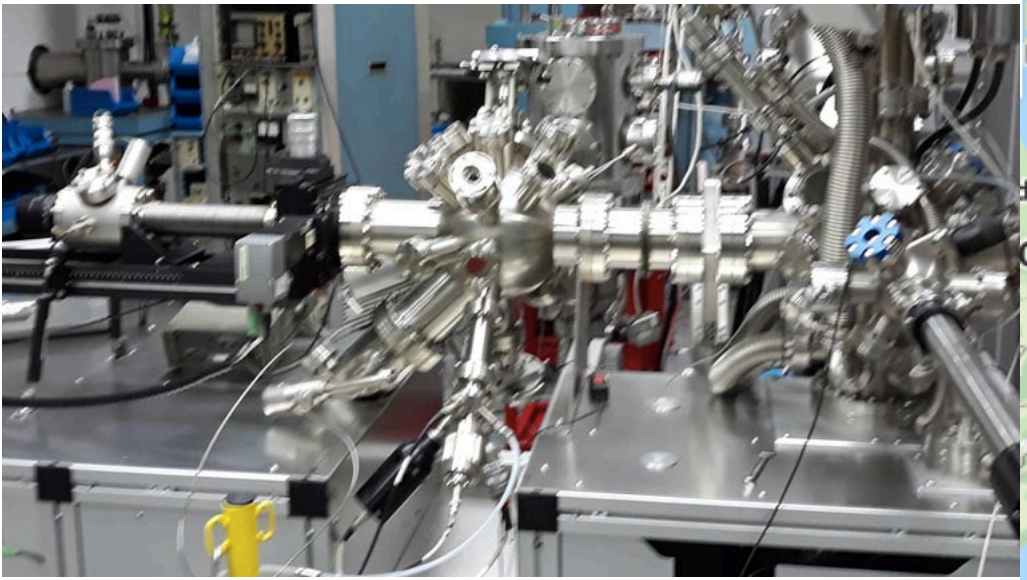
Heavy Ion group from Vinča institute of nuclear sciences to join MPD NICA Collaboration

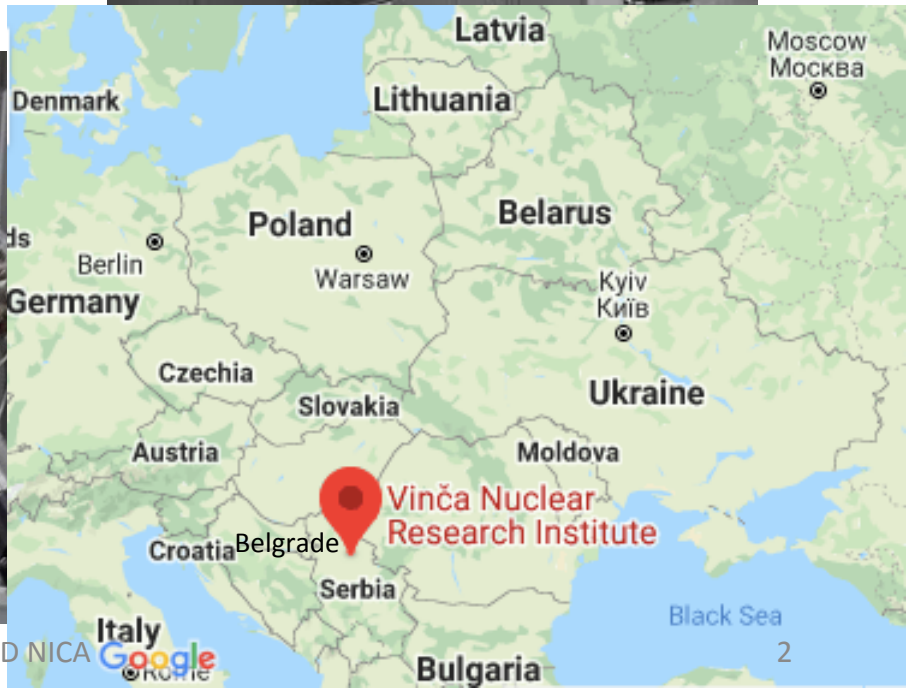


Vinča institute of nuclear sciences

- Founded in 1948
- A multidisciplinary institute

  physics, chemistry, biology, power engineering and technology, radiation and environmental protection, production of radiopharmaceuticals, accelerator science, and nanoscience
- More than 500 researchers and PhD students
- 70 national projects financed by MESTD
- In 2018, the Government declared the INS Vinča as the National Institute of the Republic of Serbia

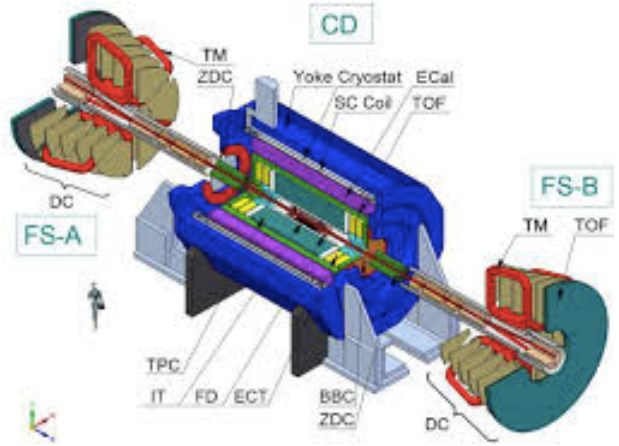


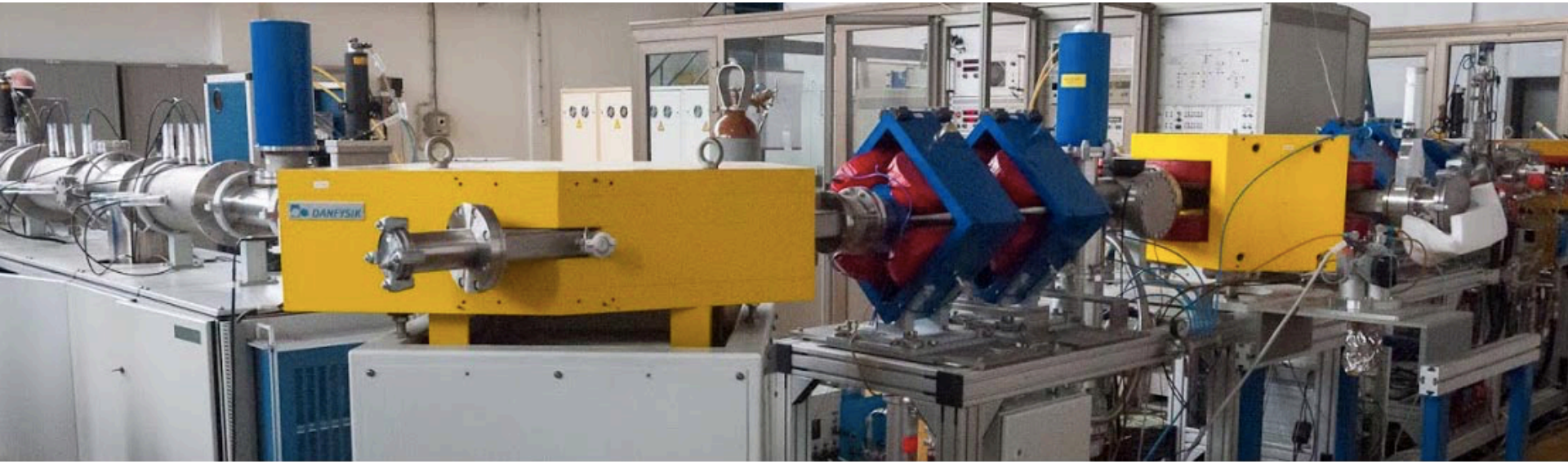


Vinča institute of nuclear sciences

- In last 10 years over
  - 3000 papers in international journals
  - 200 plenary lectures
  - 700 conference proceedings
- INS Vinča has an excellent international cooperation
- INS Vinča has 20 departments, one of which is laboratory of physics with about 50 collaborators
- INS Vinča is a CMS CERN member

- Serbia is associated member of JINR
- Serbia will collaborate with NICA at both, SPD and MPD collaboration.





The group from INS Vinča to join MPD

Dr. Jovan Milošević (group leader) Research Professor, Member of CERES/NA45, ALICE and CMS, expertise in physics of strongly interacting matter at extreme energies in A-A, p-A and p-p collisions, PhD in Heidelberg, post-doc in Oslo, 3 PhD thesis supervised, 16 ARC chair/member at CMS, more than 30 talks at conferences. Several invited lectures. SCOPES project and bilateral cooperation with China. Reviewer for project grants at NSC, Poland, and SNSF, Swiss.

Dr. Laslo Nađđerđ: Associate Research Professor, Member of CMS since 2017, expertise in nuclear and physics of strongly interacting matter at extreme energies, matrix method calculations, signal analysis, 1 PhD thesis supervised, proficiency in usage of programming languages (C++, Fortran) in data analysis, also Linux and batch systems (Lxplus, Condor)

Dr. Dragan Toprek: Research Professor, Expertise in cyclotrons and energy beam lines, Research experience in Accel instruments GmbH and Riken, and Manchester, Groningen, Uppsala and Warsaw University, Leader of two bilateral cooperations with GSI (Germany) and with GANIL (France)

MSc. Dragan Manić: Lecturer at International School of Belgrade with INS Vinča affiliation, Research experience in data simulation at DESY (Germany), CP violation at LAPP (France) as a member of LHCb, quark-gluon plasma at Belgrade University as a member of NA61. Now works as a physics teacher at International school of Belgrade

If we join MPD, we will be allowed to hire a new staff member, and possibly two

Our experience

◆ International Collaborations

- CERES/NA45, SPS CERN: 2000 − till now
- ALICE, LHC CERN: 2000 − 2018
- CMS, LHC CERN: 2010 − till now
- LHCb, LHC CERN: 2009 − 2010
- SHINE/NA61, SPS CERN: 2011 − 2018

◆ International cooperations

- Cooperation between Advanced Science Research Center, JAEA, Japan and INS Vinča
- 3 bilateral cooperations between:
  Republic of Serbia and the People Republic of China
  INS Vinča and GSI (Germany)
  INS Vinča and GANIL (France)

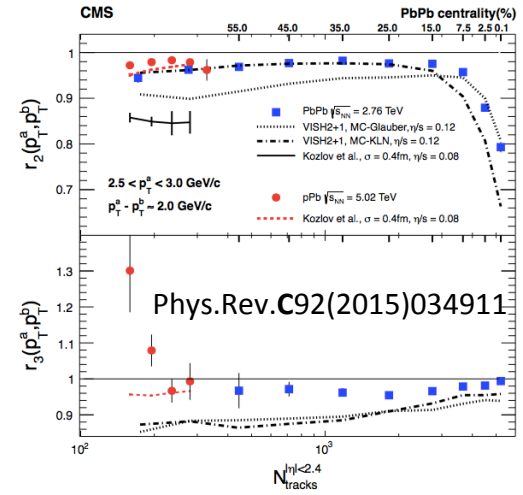
◆ Projects

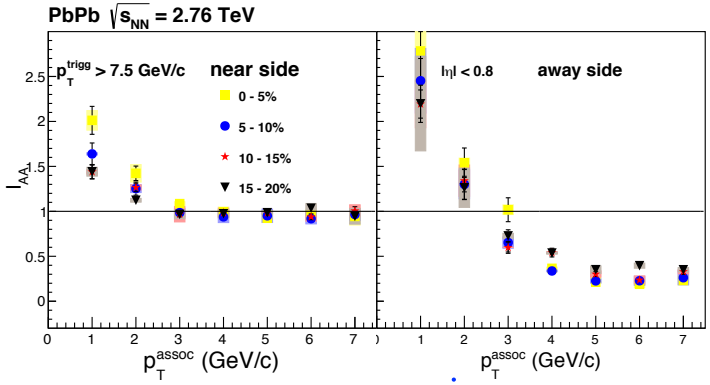
- Coordinator of INS Vinča, SCOPES project, Swiss: since 2014 − till 2017
- Within project "Exploring the nuclear phase diagram using hard and electromagnetic probes" (Norwegian Research Council) founded and led 3 subprojects: 2006 − 2012
  1. Collective flow in heavy-ion collisions at LHC, measured by the ALICE detector
  2. Studies of jet quenching using dihadron correlations
  3. Search for collective flow in proton-proton collisions
- 4 PhD thesis supervised, more than 40 talks at conferences, several invited lectures.

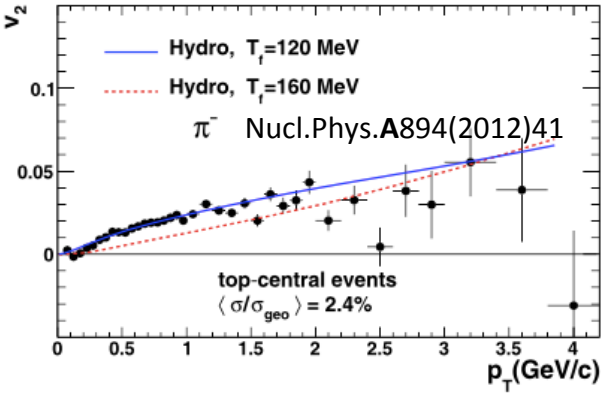
Our physics interests and publications

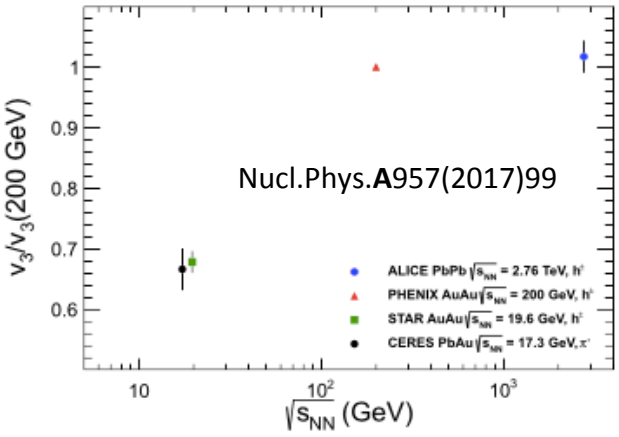
- Flow
- Jet quenching
- Collectivity in small systems

- More than 40 papers.
- 13 of them CERES/NA45, CMS and SHINE/NA61 Collaboration papers

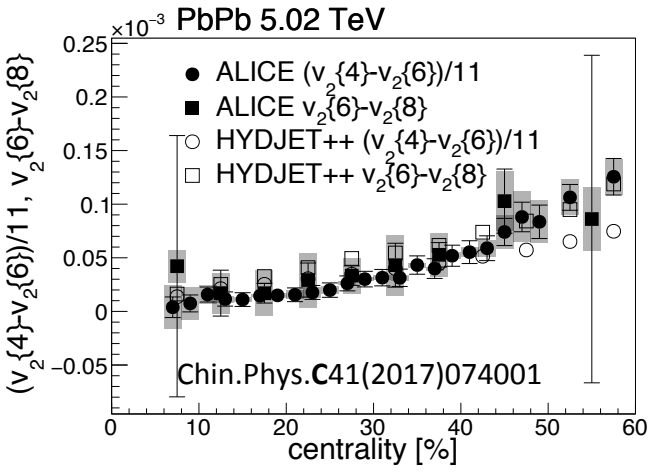








And many more results…

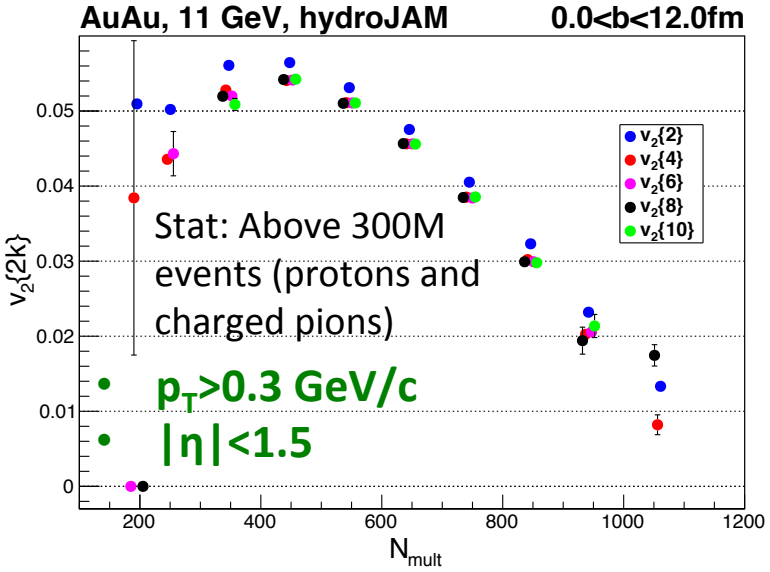


Our physics interest in the MPD

We believe there is a very rich physics in the NICA energy region (highest baryon density, critical point, chiral symmetry).

We are primarily interested in physics analysis of MPD. Our main physics interest:

- Flow:
- We have developed codes to measure $v_n\{2k\}$, k=1,…,5.
- For the first time tested $v_n\{10\}$ with JAM simulation
- MPD statistics will allow $v_n\{2k\}$, k=1,…,5 measurement in a wide centrality range.
- To measure flow fluctuations (e.g. skewness) and perform hydrodynamics probes:
  $(v_2\{6\} - v_2\{8\})/(v_2\{4\} - v_2\{6\}) = 1/11$
  $(v_2\{8\} - v_2\{10\})/(v_2\{6\} - v_2\{8\}) = 3/19$
- To study NCQ scaling of the v_n
- To check p_T independence of the $v_n^{1/n}/v_2^{1/2}$



- Chiral Magnetic Effect (CME)
- Less developed so far but contain important physics
- Analysis techniques similar to flow
- Have started model simulation studies

What we can bring to MPD

- We bring with us a long experience in heavy ion physics research.
- We would be able to make contributions to the physics analysis projects.

- We could contribute to physics simulation and detector simulation efforts

- Our group can devote ~2+1 FTE to work on MPD.

- We wrote a project proposal concerning our work on the MPD, and submitted it to The Joint Coordination Committee from whom we expect a financial support

- Mobility: Once or twice per person per year, depending on the need

Thank you for your attention!