

Passport of the experimental-accelerator complex «Nuclotron Based Ion Collider fAcility (NICA)»

Location: Joint Institute for Nuclear Research (JINR), Dubna, Russia

Initiating organization: Joint Institute for Nuclear Research

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Project web-site: <http://nica.jinr.ru/>

Period of project implementation: 2010-2023

Cost of the mega-science project: \$540 million

Brief description, the primary purpose of the construction.

The NICA Complex (Fig.1), a modern experimental-accelerator facility, will perform world-leading programs in long base line relativistic heavy ion physics and particle physics in the field of investigation of the nucleon spin structure; radiobiology, applied research and possibilities to train young scientists. It will be a unique facility worldwide as it will be able to support multiple research programs using a wide range of high intensity ion beams and modern experimental set-ups.

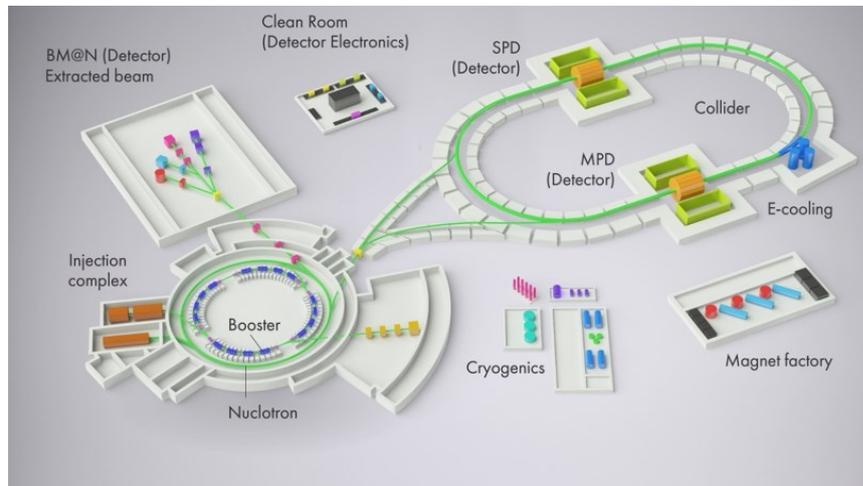


Fig.1. Scheme of the NICA complex

Unique character (main advantages). NICA is an international project that is implemented by the international intergovernmental organization – the Joint Institute for Nuclear Research, it unities the efforts of scientists and engineers from 18 member and 6 associated countries. Accelerators of the NICA complex will allow providing investigations with heavy ion beams at the energy range corresponding to the maximal net baryonic density reached in the laboratory conditions. The scientific importance and uniqueness of the NICA project is widely proved by the international community. Thus, in 2016, the project was financially supported by the Russian Federation government, in 2017; it was included into the ESFRI road map as a project complimentary to FAIR.

NICA Complex accelerators are based on unique superconducting superferric fast cycling magnet technology developed at JINR. This one-of-a-kind technology is applied for the FAIR SIS-100 project, as well.

Scientific and practical importance. The main scientific goals of the project are:

- the study of hot and dense strongly interacting matter in heavy ion (up to Au) collisions at centre-of-mass energies up to 11 GeV/n. Two modes of operation are foreseen, collider mode and extracted beams, with two detectors: Multi Purpose Detector (MPD) and Baryonic Matter at Nuclotron (BM@N), correspondingly.

- the investigation of nucleon spin structure with extracted and colliding beams (with Spin Physics Detector – SPD) of polarized deuterons and protons at the energies at the center of mass up to 27 GeV/n (for protons).

The proposed program allows searching for possible signals of the phase transitions and critical phenomena as well as to shed light on the problem of nucleon spin structure.

The NICA accelerator facility will provide numerous ion beams of wide parameter spectrum. That allows one to perform both applied and fundamental research in different fields of science and technology. The following can be pointed out::

- radiobiology including researches aimed at the “space programme” ;
- cancer therapy;
- development of accelerator driven reactors (“energy generation” with subcritical plutonium blankets) and radioactive waste transmutation;
- test of radiation proof electronics

and other.

Training program using the facility for performance of research works having the goal of teaching of young specialists.

Current state. The NICA Project was started as a part of the JINR Roadmap for 2009-2016 described in the JINR 7-years Plan. It was approved by the JINR Scientific Council and The Committee of Plenipotentiaries of JINR in 2009. Officially, the collider building construction was started in March, 2016. Start of the heavy ion experimental program at BM@N is expected in 2018. Commissioning of the collider in start-up configuration is scheduled for 2020.