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Experiment to demonstrate a possibility of creation of the tensor polarized heavy ion beam in the NICA injection complex

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Various models of polarized nuclear matter are considered in astrophysical studies of neutron stars and magnetars (stars with magnetic fields up to ~1016 G). Recently, there has been a growing interest to study the nuclear orientation effect to the characteristics of non-spherical heavy-ion collisions. Thus, the possibility to carry out research with polarized heavy ions opens the way to obtain unique experimental data for astrophysical and heavy-ion research.
In the talk we discuss an experiment aimed to demonstrate formation of tensor polarized heavy ion beam in beam passage through a medium. The experiment is planned to be carried out in the NICA injection complex of LHEP of JINR with 21Ne ions accelerated to about 3.5 GeV/n.
To meet the beam intensity requirement of NICA collider program, the productivity of its injection complex needs to be increased by well above an order of magnitude relative to achievements of the previous Runs. The intensity increase will be accomplished by beam accumulation in Booster at the injection energy with usage of electron cooling and reduction of beam loss in the course of acceleration.
This drastic increase in number of ions enables obtaining the Tensor polarization achieved by large intensity reduction of primary ion beam. The polarization is achieved by beam passage through a target. Since, for nuclei with large quadrupole moment, the nuclear interaction length depends on ion the polarization the beam coming out of the target will have tensor polarization. To minimize effects of multiple scattering the target will be made out of small Z material (beryllium or lithium). For the target with thickness of about 4 nuclear lengths, and consecutive loss of ~98% of the beam, the tensor polarization of about 50% is expected.
The talk discusses:
• requirements to the intensity and time structure for the beam slowly extracted from Nuclotron,
• details of beam transport and beam focusing on the target,
• behavior of polarization in the bending magnetic fields,
• the beam collimation and the beam delivery to the detection system,
• the separation of outgoing 21Ne beam from fragments produced in the target and finding out the analyzing power of the experiment,
• and requirements to the detectors and their possible implementation.

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