Report
on the project HADES: JINR contribution (t. 1106).

HADES spectrometer is designed for systematic study of properties of hadrons in hot and dense matter on SIS-18 accelerator in GSI. Its main task is to register electron-positron pairs generated in the collision of nuclei. The spectrometer has unique parameters-large acceptance (solid angle of dileptons registration) and high mass resolution (~ 1% in the mass area of p-meson).

HADES is one of the main detectors, which is actively used during Phase0 at SIS-18 and is preparing to perform the researches at the acceleration complex FAIR on SIS-100 up to energy of nuclei of 10 AGeV (Ni+Ni). Collaboration work is underway on the upgrade of the spectrometer and the elaboration of the physics programme.

The large penetrating capability of dileptons formed at different stages of nuclear collision could clarify the deep properties of matter, such as modification of properties of particles in a nuclear environment and restoration of chiral symmetry, and also to investigate new possible states of matter, for example, the mixed quark - hadron phase and quark - gluon plasma itself. The collaboration successfully collects experimental data in nuclei- nucleus, proton and pion-nucleus and nucleon - nucleon interactions. The results of dilepton yield for different systems are unique. In particular, a unique experiment performed on HADES using a deuteron beam allowed to resolve the "DLS Puzzle", i.e. multiple excess of dilepton yield in the range of invariant masses of about 150 - 550 MeV compared to the values predicted by theoretical models. The results obtained at HADES allowed to the theorists to conclude that this excess can be explained by a large cross section of the "bremsstrahlung radiation" in neutron - proton interactions.

JINR specialists carried out important work on the development and creation of ONE of the planes of multilayer drift chambers of the HADES spectrometer; electronics for reading information from drift chambers of the spectrometer; mathematical software for the search and reconstruction of the tracks in the system of drift chambers of the spectrometer, which is successfully used in the process of the taking and processing of the experimental data. They are developing software for the new RICH and forward detector. LHEP JINR staff is actively involved in the data taking and interpretation of data on the formation of charged pions in NN and πN reactions, on the measurement of the angular dependence of the deuteron-proton elastic scattering cross section.

JINR resources spent on the implementation of the project and necessary for further work are justified. I consider that the work on the HADES project should be continued in 2019-2021 yy. with the first priority.

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