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

The spectrometer HADES is designed for systematic study of the properties of hadrons in hot and dense matter in the most interesting intermediate energy range at the accelerator SIS-18 (GSI). The key feature of the spectrometer is the precision registration of electron-positron pairs in nuclear collisions. The installation possesses unique parameters, large acceptance and high mass resolution (~ 1% in the ρ-meson mass range). The HADES collaboration has been successfully collecting experimental data on nucleus-nucleus, proton- and pion-nucleus, as well as nucleon-nucleon interactions. The results on dilepton yield for different systems are unique. In particular, the unique experiment performed at HADES with the deuteron beam resolved the so called "DLS Puzzle", i.e. multiple excess of dilepton yield in an invariant mass range of about 150 - 550 MeV, as compared to the values predicted by the traditional theoretical models. The results obtained at HADES yielded the conclusion that this excess can be explained by the large cross section of "bremsstrahlung radiation" in neutron- proton interactions.

HADES is one of the main installations at SIS-18, it is being prepared for upgrade and research at the acceleration complex FAIR at nuclei energies of up to 10 AGeV (Ni+Ni). The new physics program with SIS-100 beams has been currently developed by the collaboration.

JINR researchers made the decisive contribution in the development and manufacture of one of the planes of the multilayer drift chambers of the HADES spectrometer; the readout electronics for the drift chambers of the spectrometer; the software for the search and reconstruction of tracks in the system of drift chambers of the spectrometer successfully used in the data accumulation and processing. The software for the new RICH and forward detector is being developed at JINR. LHEP JINR researchers are actively involved in the processing and interpretation of the data on charged pion production in NN and πN reactions, on the measurement of the angular dependence of the deuteron-proton elastic scattering cross section.

The JINR resources spent on the implementation of the project and the funding required for continuation of the work are justified. The work in the framework of the HADES project should be continued in 2019-2021 with the first priority.

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