INFORMATION TECHNOLOGY AND COMPUTER PHYSICS

A heterogeneous computing environment, based on the DIRAC platform, was created for processing and storing data of the MPD experiment within the NICA megaproject. Owing to DIRAC, the computing resources and the hierarchical hyper-converged data processing and storage system of the "Govorun" supercomputer were included in the created environment. The "Govorun" supercomputer plays a key role in the environment and, due to the flexibility of the architecture, it enables to test in practice the latest software and hardware solutions in the field of computing and data processing.

- *Moshkin A. A., Pelevanyuk I. S., Podgainy D. V., Rogachevsky O. V., Streltsova O. I., Zuev M. I.* Approaches, Services, and Monitoring in a Distributed Heterogeneous Computing Environment for the MPD Experiment // Russian Supercomputing Days: Proc. of the Intern. Conf. 2021. P. 4–11.

Studies in the field of working with Big Data are carried out on the "Govorun" supercomputer using the novel technology DAOS (Distributed Asynchronous Object Storage). For this purpose, a DAOS polygon was deployed on the "Govorun" supercomputer; it ranked 16th in the "10 node challenge" nomination in the current edition of the IO500 list. Great prospects for the use of this technology are related to the NICA megaproject at all stages of the accelerator operation — from experimental data acquisition to final physical analysis.

- *Kudryavtsev A. O., Podgainy D. V., Moskovsky A. A.* On-Demand DAOS Storage for Data Processing and Analysis in High Energy Physics: A Case of LIT JINR Data and Compute Infrastructure // ISC High Performance 2021; https://www.isc-hpc.com/.
- *Moskovsky A. A., Brekhov A. T., Podgainy D. V., Kudryavtsev A. O.* Hyperconverged Storage for High Performance Data Analysis in High Energy Physics: A Case of Intel DAOS Deployment // Sixth Intern. Parallel Data Systems Workshop, 15 Nov. 2021; https://sc21.supercomputing.org/session/?sess=sess332.
- *Val'a M., Podgainy D., Lavrenko P., Brekhov A.* High Energy Physics Experiment Data Processing with DAOS in Multi-Tier Storage Environment Based on RSC Storage On-Demand // The 5th Annual DAOS User Group Meeting, 19 Nov. 2021; https://daosio.atlassian.net/wiki/spaces/DC/pages/11015454821/DUG21.

In 2021, in terms of performance, JINR Tier1 ranked first in the world among Tier1 centres for the CMS experiment. The JINR Tier1 resource centre is used for processing and storing data of the CMS experiment (CERN), as well as for modeling data within the NICA project.

The JINR Tier2 site (JINR-LCG2) is the most productive in the Russian consortium RDIG (Russian Data Intensive Grid) and ranks
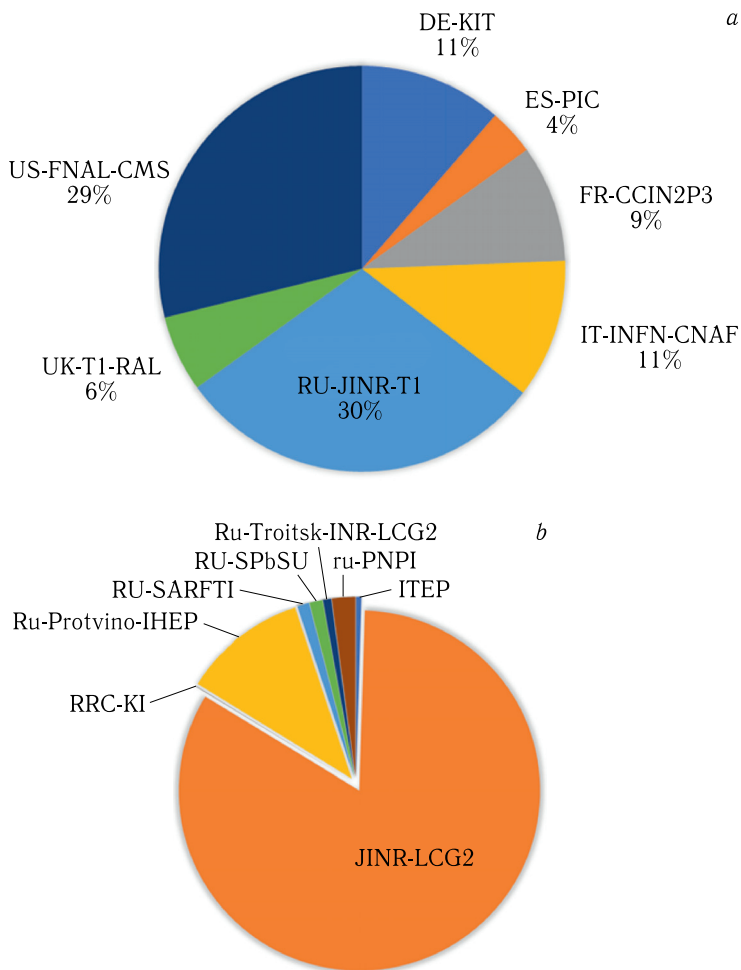
Distribution by the normalized CPU load time in HS06 hours within 2021 for (*a*) Tier1 sites for the CMS experiment and (*b*) Tier2 sites being part of the RDIG consortium

17th among 124 WLCG (Worldwide LHC Computing Grid) Tier2 sites. The Tier2 resources are used by all experiments at NICA and the LHC, ILC, Biomed, NOvA, as well as by JINR local users.

- *Baginyan A. et al.* Current Status of the MICC: An Overview // CEUR Workshop Proc. (in press).

The spectrum of vibrational-rotational bound, metastable states and scattering states of the beryllium dimer in the ground $X_1\Sigma_g^+$ state was calculated. The problem was solved using potential curves and the authors' software package KANTBP 5M, which implements Newton's method and the high-accuracy finite element method. The spectrum of rotational-vibrational metastable states of the beryllium dimer with complex energy eigenvalues, as well as the spectrum of vibrational-rotational bound states, which is in good agreement with the results of other authors, was obtained for the first time.

- *Derbov V. L. et al.* Spectrum of the Beryllium Dimer in the Ground $X_1\Sigma_g^+$ State // J. Quant. Spectrosc. Radiat. Transfer. 2021. V. 262. P. 107529.