

INTRODUCTION

In the year 2003, the activities of the Joint Institute for Nuclear Research were marked with most important scientific achievements. Firstly, it was the success in the synthesis of the elements with $Z = 115$ and $Z = 113$. This work was accomplished on a high level of methods and unique achievements of the experimental technology. It continues and develops the cycle of successful research at JINR in the synthesis of isotopes of new superheavy elements.

In October, 2003, one of the oldest Laboratories of the Institute, the Veksler and Baldin Laboratory of High Energies, celebrated its 50th anniversary. The Laboratory community received congratulations not only on the jubilee — new scientific results were obtained at the Nuclotron in 2003: for the first time argon and iron ions were accelerated up to relativistic energies. One more achievement was the beam extraction of accelerated deuterons with a beam time duration of 10 seconds in the December run of the facility.

Theorists of the Institute have analyzed quark distributions obtained in the SMC and HERMES collaborations. It was shown that while the SMC results for the first moments of the polarized quark distributions were in good agreement with the Bjorken sum rule, the HERMES results strongly contradicted them. Possible reasons for this contradiction were indicated together with methods for improvement of the asymmetries' analysis in the semi-inclusive experiments. Arguments were presented which indicated a possibility of realizing a nonsymmetric scenario for the polarized sea of light quarks.

Theoretical studies have been done which concluded the solution of the Heisenberg–Van Vleck problem of integrable spin chains with a variable radius of an exchange interaction. New results summarized the facts known before in the theory of one-dimensional models of interacting objects. They were solved precisely. The related model is named now the Inozemtsev model.

New interesting results of neutronographic studies of the crystals from the manganite family were obtained in the experiments at the IBR-2 pulsed reactor. Experimental research in the magnetic and nuclear structure of manganites with a huge magnetic resistance was concluded at the Fourier diffractometer. A large-scale exfoliation was first discovered, which has still no theoretical explanation. Unique results on the observation of the isotopic substitution influence on the magnetic phase transitions have been obtained for the first time in the world.

In 2003, in accordance with the schedule, a new MR-3 movable reflector for IBR-2 was developed. This work is vitally important for the start-up of the reactor planned for the summer of 2004. The Ministry of Atomic Energy of the Russian Federation supported financially the reactor modernization. In the framework of the IREN project, the mounting of the supporting elements and the assembling of the first part of a new linear electron accelerator were performed.

JINR scientists continued to take part in current experiments aimed at the research in fundamental properties of elementary particles and their interactions, as well as the study of rare weak processes to check the predictions of the Standard Model and search for the new physics phenomena beyond it, measurements of the direct CP -violation parameters, thorough research into the neutrino nature and properties.

JINR staff members made a considerable contribution to the NA48 experiment (CERN), where one more important result was obtained: a new decay of K_S mesons to $\pi^0 e^+ e^-$ and $\pi^0 \mu^+ \mu^-$ was discovered.

JINR scientists are involved in the following parts of the LHC programme: ATLAS, CMS and ALICE, and accomplish their obligations in full volume and in time. In October, 2003, a test assembling of the central section of the hadron calorimeter barrel was made at CERN for the ATLAS set-up. Sixty-four modules had been developed at JINR for it. The strict (according to

the project) assembling of the barrel was achieved owing to the application of methods and precision metrological control programmes worked out by the JINR specialists.

JINR scientists take a most active part in the NEMO-3 project (France). The low-background high-efficiency NEMO-3 spectrometer is manufactured from radiation-free construction materials. Due to this, it is possible to analyze practically all the characteristics of the 2β decay. First preliminary results in the study of the double neutrino and neutrinoless beta decay for a number of isotopes are in good agreement with the best world statistics.

In 2003, the capability of the external channel of the JINR computer net was enlarged. It provided the access to the Russian and international computer nets through RBNET. A test complex on the basis of the GRID technologies was developed, the GRID technologies were introduced into the experimental data processing. A project was prepared together with Russian scientific centres to establish a European GRID infrastructure. It is planned to start in 2004.

275 students from universities in the JINR Member States studied at the JINR University Centre. JINR postgraduate courses continued their work in 10 specialities in physics and mathematics, where 70 people studied.

In 2003, the programme «Dubna International School on Modern Theoretical Physics» (DIAS-TH) started successfully. Annual student summer practice courses are planned within its framework in JINR's scientific trends. Lecturers and young scientists from JINR and CERN are to be invited. Dubna University opened the chairs of theoretical physics and nuclear physics, which are headed by leading JINR scientists.

For many years JINR specialists have been closely participating in the development of large nuclear physics facilities for the Member States. Joint activities are continued to construct a cyclotron for Slovakia. In December, 2003, in Astana, the meeting at the Ministry of Energy and Natural Resources of the Republic of Kazakhstan discussed the question of the joint JINR–INP (Kazakhstan) project to develop an interdisciplinary research complex at the Eurasian National University named after L. Gumilev. It will be established on the basis of the DC-60 heavy ion accelerator, which will also be worked out and assembled at JINR.

In 2003, in the framework of the June session of the JINR Scientific Council, a round-table meeting «Romania at JINR» was held. Representatives of scientific centres, universities and organizations of Roma-

nia took part in it. A copy of the booklet «Romania at JINR», published on the materials about the long-standing cooperation, was presented to President of Romania I. Iliescu, who visited Moscow on 4 July 2003. During the talks, I. Iliescu stressed once more the importance of scientific cooperation between JINR and Romanian research centres.

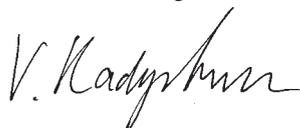
The development of partner relations with the countries who express their intention to participate in the activities of JINR on the basis of the Associate membership holds much promise. In November, 2003, in Moscow, I met with Minister for Science and Technology of India Professor B. Ramamurti. He informed JINR authorities that the agreement between JINR and India would be signed in 2004, accounting for previous arrangements.

Close scientific contacts have been established in the relations of JINR with research centres of the South African Republic. During the meeting of the Joint South African–Russian Board on science and technology (12 November 2003), General Director of the Ministry of Science and Technology of SAR Professor R. Adam suggested that an agreement between JINR and SAR on the governmental level should be signed.

A variety of conferences, seminars, and schools organized and held by JINR alone and together with other research centres were held in 2003. About 5000 scientists took part in the conferences at JINR and research centres in Russia, as well as in Armenia, Belarus, Bulgaria, Czechia, Poland, Slovakia and Ukraine. Conferences dedicated to the memory of D. Blokhintsev, V. Dzhelepov, B. Pontecorvo, G. Flerov and I. Frank were a great success.

A remarkable event of the year was the joint JINR–CERN poster exhibition «Science Bringing Nations Together» in Yerevan State University in Armenia and in the Diplomatic Academy of the RF Ministry of Foreign Affairs in Moscow. The exhibition has already visited Norway, France, Switzerland, Belgium, Romania and several times Russia. In 2004 the exhibition will be demonstrated in Greece.

In October, 2003, the final text of the «Scientific Programme of the JINR Development in 2003–2009» was published. This document is of immense importance. All the JINR community took part in its compilation. It charges the Institute to achieve new results in fundamental and applied research, to develop and modernize the experimental basis, to establish modern infrastructure, to participate in most significant experiments at scientific centres of the world, to further promote fruitful and mutually beneficial cooperation.



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