Progress and development of CA-NRDB

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The need in establishing a database on nuclear reactions (first in Central Asia) was announced at the international meeting of the Asia database representatives at Hokkaido University, Japan, 2011.The Chair of theoretical and nuclear physics of the Physics and Technology Department initiated then an establishing of the database at al-Farabi Kazakh National University. Establishing of the database was supported by the Institute of Nuclear Physics (Kazakhstan), National Nuclear Center of Kazakhstan, the Institute of Nuclear Physics under Academy of Sciences of Uzbekistan, Gumilev Eurasia National University, Fesenkov Astrophysical Institute under National Center for Space Research and Technologies of the National Space Agency of Kazakhstan; an official endorsement has been obtained from the Atomic Energy Agency of Kazakhstan.

Organizers of the database have developed and presented to the Ministry of Education and Science the research project which got moderate funding in 2013 – 2015. A plan of works has been elaborated and a team junior students majoring in physics has been established.

At all the stages of database elaboration, a lot of support was provided by Prof. K.Kato and his research team in Hokkaido University. Our joint work is developing in the following directions: training of personnel and junior scientists, joint research in theoretical nuclear physics, new international cooperation projects, organization of international conferences and workshops.

Establishing the database which got the name *Central Asia Nuclear Reactions Database* (CA-NRDB) it was important to identify its distinguishing features. Location of Kazakhstan and local activities back in USSR times have predetermined one of such features: Kazakhstan was a land of many testing sites including Semipalatinsk Nuclear Test Site where 456 nuclear devices were exploded. Decontamination, rehabilitation and radioactive waste issues there became the priority in the state agenda.

Specialists of al-Farabi Kazakh National University and National Nuclear center, nuclear physicists, radiochemists, biologists and environmentalists took active part in numerous research and activities there. Research outcomes are published by IAEA and a variety of international organizations. One of the divisions of the CA-NRDB will be devoted to radio-ecology issues.

Another distinguishing feature is stipulated by multiethnicity of Kazakhstan: the CA-NRDB will be created in three languages – Kazakh, English and Russian. The database is designed to support educational activities, scientific research and technology development. An extensive electronic library will also be created to incorporate textbooks, presentations, lectures, scientific papers, etc. The English-language version of the CA-NRDB is designed for incorporation into the international network of the nuclear data bases under IAEA. The core of the CA-NRDB would be the development of the database for nuclear physics and nuclear astrophysics.

Currently, the small team of the CA-NRDB consists of two full-time employee and 4 part-time assistants (graduate students majoring in nuclear physics). Since the turnover among the part-time junior employees is quite high, it is a bit challenging to assure stable operation and efficient qualification improvement of the staff; we work towards mitigation of such factors.

In spite of some difficulties, the CA-NRDB team has got considerable progress. The own website has been designed, vast data have been collected and proceeded, particularly for the educational part of the resource, we organized publishing of own pre-prints. A pilot version of the CA-NRDB has been launched at the University’s web portal, the structure and main components have been shaped.

Efficiency and usefulness of a nuclear reactions database is directly related to the organization of a high-speed and multi-channel search engine. This important technical and optimization task implies development of new information methods and our team is doing that in cooperation with foreign scientists and specialists.

The research objects are published papers and works on nuclear physics and nuclear reactions, experiments at particle accelerators, descriptions of experimental facilities and experiments, computer searching engines, calculational and analytical software packages.

The project team takes part in activities of the international nuclear database network under IAEA, digitalize and compile the data. The compiled papers and works undergo multilevel expert assessment. IAEA performed and approved for incorporation to EXFOR about two dozens of compiled papers by scientists from Kazakhstan, Uzbekistan; there were reviewed and prepared for compilation about a dozen more papers by Kazakhstani scientists published in soviet times. For instance, there was recently compiled a paper of I.N. Khaustov team “Excitation function and yields of bismuth and led isotopes in the 203Ti reaction with 3He ions” published in 1990 by the journal “Transactions of the Academy of Sciences of KazSSR”. This work contains data on (He3,xn) reaction sections at Ti232 isotope for He3 beam energies within the range 20 - 60 MeV. The targets were irradiated at the extracted beam of the isochronous cyclotron U-150 at the Institute of Nuclear Physics of Academy of Sciences of KazSSR. Gamma-spectra of the irradiated targets were measured at the spectrometer with programmed multi-channel amplitude analyzer IN-96B (France). Compilation of data from that paper was appreciated by the experts.

An important task is to further develop the software, to train for work with specialized software packages such as EXFOR, HENDEL, GSYS and others.

Supported by the Atomic Energy Committee under MIIT of the Republic of Kazakhstan, the team members of CA-NRDB took part for the first time in a technical workshop organized by IAEA for the specialists of the international nuclear data bases in Smolenitsa (Slovakia) on May 3 - 9, 2014. Representatives of various data centers presented there and discussed common issues related to compilation of nuclear data and international cooperation.

A project proposal for the state funding application for 2015 - 2017 has been prepared in cooperation with foreign scientists and specialists. Such competition for funding through the Ministry of Education and Science has been announced in Kazakhstan for the first time. We look forward to our fruitful cooperation with the CA-NRDB team in Hokkaido University.