The Status of Nuclear Data Activities in Ukrainian Nuclear Data Center

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Introduction

UKRNDC was established in 1996. At the end of 1998 UKRNDC and Neutron Physics Department at Research Reactor (Institute for Nuclear Research, Kyiv) were merged together. The amount of neutron research works at reactor now is rather small, but we are sure that the raise of neutron work is in near future. Soon, we hope, our reactor will operate regularly and systematically. Tandem accelerator is close to its physical parameters and regular work. So, we see the future for our inputs in a world bank of experimental results.

Computer Network in UKRNDC

In the framework of STCU Project we developed the computer environment in our Center. Now it includes the Web-server (PC Pentium II, 400 MHz, 20 Gb) with the nuclear data bases for customers in our Institute and other organizations of Ukraine. This network includes also Unix Workstation ESCALA S120 (375 MHz, 4.5 Gb - fast and power European analog of RISK 6000, model 240) and 6 PC Pentiums connected into the local net. This local network is connected to the INR Server and is available to the assigned users in the Institute and others having the access to Internet (see the Figure).

This year we opened Web-site of our Center. One of the main aims of this site is the desire to facilitate the access to the basic nuclear databases for Ukrainian users, especially for beginners, as the proposed databases are located in our Web-server and this is the most short, fast and friendly way to necessary data (see Appendix 1).

By October 1999 we finished our contract with Slavutych Laboratory, where we helped to develop Nuclear Data Bank. Now, in practice, this is the mirror database of NNDC, USA. The last visit of NNDC representative (C.L. Dunford) for revision and updating was in December 1999. Now two Dec Alpha computers operate there (Open VMS, v.7.1 with databases and Dec Unix Workstation with RSICC codes). Now this Data Bank is under service of Slavutych Laboratory staff. The part of this staff was trained by our specialists during 1998-1999.

Work with Nuclear Data

Compilation of neutron experimental data from publications in Ukrainian editions started in 1998, after the training visit to NNDC (M. Vlasov). Now we prepared 5 entries (19 subentries) in EXFOR format to be included into CSISRS. This work continues. Two persons of our staff are engaged in this activity (see Appendix 2).

Activation Data Analysis

The special interest to activation data in our Center is connected as with the development

of Reactor Dosimetry in our Institute, so as with the experimental abilities to measure some important cross sections, for example reaction ^{93}Nb(n,n') ^{93m}Nb.

Using ZVView code (ver.9.0) the comparative analysis of IRDF files and the files from ENDF and CSISRS libraries for reactions ^{19}F(n,2n)^{18}F, ^{24}Mg(n,p)^{24}Na, ^{31}P(n,p)^{31}Si, ^{27}Al(n,p)^{27}Mg, ^{32}S(n,p)^{32}P, ^{45}Sc(n,gamma)^{46}Sc, ^{46}Ti(n,p)^{46}Sc, ^{47}Ti(n,p)^{47}Sc, ^{47}Ti(n,np)^{46}Sc, ^{48}Ti(n,p)^{48}Sc, ^{48}Ti(n,np)^{47}Sc, ^{52}Cr(n,2n)^{51}Cr, ^{54}Fe(n,p)^{54}Mn and ^{56}Fe(n,p)^{56}Mn was fulfilled. In the process we noticed 2 errata in EXFOR data (entry22312) and in BROND-2 library in ^{52}Cr (n,2n). Now we continue analysis of IRDF reactions. We hope to finish this work as an Atlas of cross sections for the most important dosimetry reactions with our comments and recommendations.

One recent result of this activity - Report on INR Annual Scientific Conference, January 2000: "Reactions of isotope cobalt-60 formation at interaction of neutrons with cobalt-59, nickel-60 and copper-63 (state of the art of neutron cross sections)" by M.F.Vlasov, O.O.Gritzay, L.E.Chervonna, V.V.Zerkin.

We consider as very important isotope in Nuclear Power practice – Co-60 and in this paper we examined the main reactions of it's production.

This paper is now placed at our Web-site.

Multigroup calculations

Using GRUCON code we calculated the first turn of multigroup (51) library for neutron transport calculations of neutron fluences on the outer surface of reactor vessel and it is now in practice on operating NPPs.

After 3 months training in RSICC (O.Gritzay) we started the work on new multigroup library for Reactor Dosimetry using our Unix Workstation and the obtained experience on NJOY code. This work is going now under the contract with our Ministry of Power and in contact with the INR Laboratory engaged in fluence measurements.

Our plans for future include the calculations of multigroup library for RBMK reactor, as in accordance with the international and national decisions, Ukraine has to shut down the last unit of Chornobyl NPP and to start the process of decommissioning. Namely for this purpose US DOE financed the development of Slavutych Nuclear Data Bank and now we plan (together with the specialists from ChNPP and Slavutych Laboratory) to iniciate this very large work. We hope for the contract with STCU on this subject (this or next year).

Computer codes dissemination

Since 1996 we have the stable contacts with NEA Data Bank Computer Program Services (Liaison Officer A.Kaltchenko) and during these years we received on our requests 28 computer codes, mainly for nuclear data, Monte-Carlo and nuclear model calculations in the sphere of basic and applied physics. Among them such codes as STAPRE-H, ECIS, WIMSD-5, RADHEAT-V4 and so on. We are very much thankful to Mr. Enrico Sartori and his staff for kind attention.

We also have received from RSICC two lisenced codes NJOY 94.61 and SCAMPI. This year IAEA NDS supplied us with NJOY 97. All these codes were installed and may be used at SC "INR".

It is necessary to add that owing to our recommendations Slavutych DEC Unix Workstation is equipped with a set of RSICC codes (NJOY, TSANSX, MCNP etc) for use at

Slavutych Laboratory mainly for Chornobyl NPP needs.

Our customers

Now we see four main groups of our customers.

- Service for operating NPPs (multigroup calculations): reactor dosimetry, reactor safety, fuel management.
- Decommissioning activity: RBMK libraries, waste management, 4^{th} unit safety.
- Non power applications: medicine(NCT, BNCT therapy), medicine radioisotopes, industry radionuclides, Monte Carlo calculations.
- Fundamental investigations: nuclear physics, nuclear modelling, nuclear data evaluation, etc..

Appendix 1. UKRNDC Web-site

This year, year 2000, we started the operation of our Web-site. One of the main aims of this site is the desire to facilitate the access to the basic nuclear databases for Ukrainian users, especially for beginners, as the proposed databases are located in our Web-server and this is the most short, fast and friendly way to necessary data. We use PC Pentium II, 400 MHz, 20 Gb hard disk memory and Windows 98 system with server sub-shell. This is also the server for our center local network of 8 computers.

Now the problem is not in the access to nuclear databases, but in the practice of skilled handling with these data. The most important and scarce part of nuclear data work is now the people who know how, where and what data are needed for definite task and can do this work in a short time. Another our problem is the low speed of our communication lines. To transport the file of 5-10 Mb from any of 4 basic Centers is mostly very long time work.

So we create for our users the most simple and friendly system for data access and handling with our comments and helps outgoing of the beginners level of our customers. For those, who have good experience and may use satellite communication, we recommend to refer to NDC IAEA, NNDC USA or NEA Data Bank.

Some details of our local database:

1. It includes the map of Nuclides – we recommend the Map of Nuclides from Los Alamos Laboratory.
2. The set of general purpose ENDF libraries using IAEA NDC WINENDF CD ROM.
3. EXFOR library in the version of EXFOR II.
4. IRDF with our Supplement on Nb-93(n,n') cross section and neutron fission spectra for U-235 and Pu-239.
5. Access to ENSDF using Isotope Explorer with local database.
6. PCNUDAT from IAEA NDC CD-ROM.
7. CINDA from CD-ROM, which is available now.
8. Atomic Masses file.
9. The most necessary codes – Utility Codes and PREPRO with additional our version of PREPRO – CULLENFREE, which we consider more convenient for preparation of the input files, especially for beginners.

We give the addresses of the most popular Nuclear Data Centers and separately the access to their Newsletters. We greet any other addresses and recommendations for the content of our site.

Our addresses are those: http://www.kinr.kiev.ua/ukrndc
http://www.ukrndc.kiev.ua

Appendix 2. UKRNDC EXFOR Activity

To improve the coverage of the Ukrainian publications, containing experimental nuclear data information, obtained in the organizations of Ukraine, it was decided to start compilation and preparation of the EXFOR entries directly in the UKRNDC.

Participation in the EXFOR activity began after the IAEA AGM coordination meeting, May 1998, where it was recommended to start with neutron experimental data, as the most important one. The accession numbers 32201 – 32500 were selected for input of this data to the CSISRS system. The format was studied in Kyiv, using BNL-NCS-6330 and -6380 documents and in the NNDC, BNL (training, M.Vlasov). Up to now the entries 32201-32205 (5 entries, 19 subentries) with the experimental data obtained in the INR, Kyiv and Kyiv State University have been prepared and sent to the IAEA NDS.

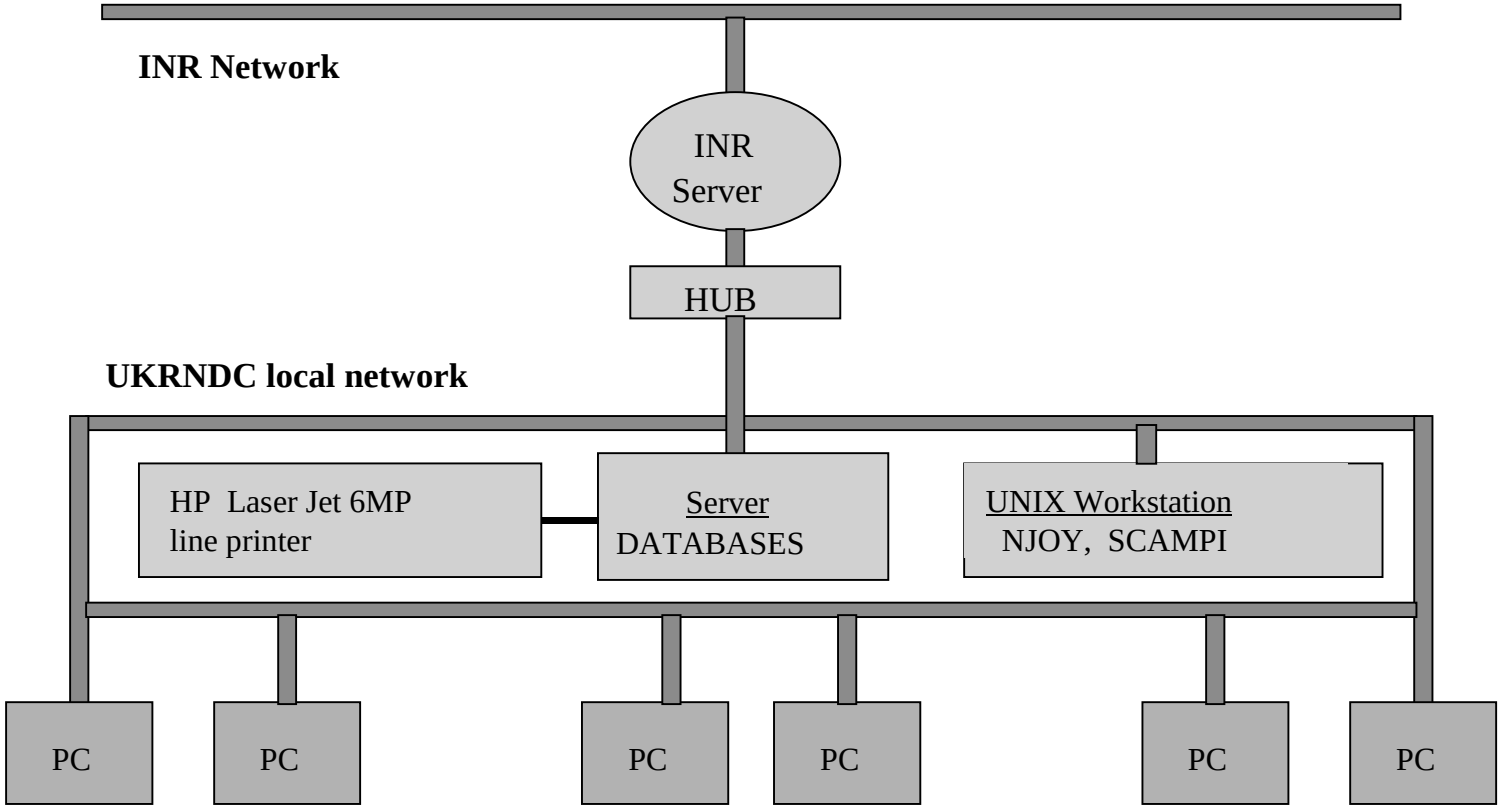
The detailed search for the ukrainian nuclear data, using scientific journals published in Ukraine, preprints of the Ukrainian institutes and INIS system, has shown that the number of publications containing neutron data is decreasing for the last years due to temporary suspension of the large facilities (research reactor, isochronous cyclotron, some other accelerators) operation though situation is changing for the better now.

At present, there is sufficient number of non neutron data, which has not been yet converted to EXFOR, and the UKRNDC is planning to start its input to CSISRS. It relates mainly to photonuclear data and in less degree to data of charged particle induced reactions.

With the help of the EXFOR —II/ACCESS-97 system recently developed at the IAEA NDS (V.Zerkin) and our search of the Ukrainian scientific publications we have analyzed

- The number of publications in Ukraine and abroad containing experimental nuclear data, obtained in Ukrainian organizations and their ratio for the last ten years: 5.5% in 1991-92, 20% in 1993-94 and 25% in 1995-2000. The ratio is increasing.
- Completeness of the coverage of the experimental results obtained in Ukraine with EXFOR for the years 1990-2000.

The results indicate very good coverage of the neutron data information. Only one work dated 1994 has been found and will be converted in the nearest future. The charged particle induced reaction data are covered also reasonably well by Kurchatov Institute group, however, there are some works which should be converted to EXFOR. We have found 13 such type experimental results (in the energy range up to 200 MeV). In the field of photonuclear data 17 papers are not covered (energy range of gamma-rays is up to 1.2 GeV) and we are planning to start converting of this data to EXFOR soon, especially in view of the development of photonuclear research at the institutes of Ukraine.


INR Network
INR
Server
HUB
UKRNDC local network
HP Laser Jet 6MP
line printer
Server
DATABASES
UNIX Workstation
NJOY, SCAMPI
PC
PC
PC
PC
PC
PC