

Possible contribution of Institute of Nuclear Physics to EXFOR compilation

T.Zholdybayev

Head of Laboratory

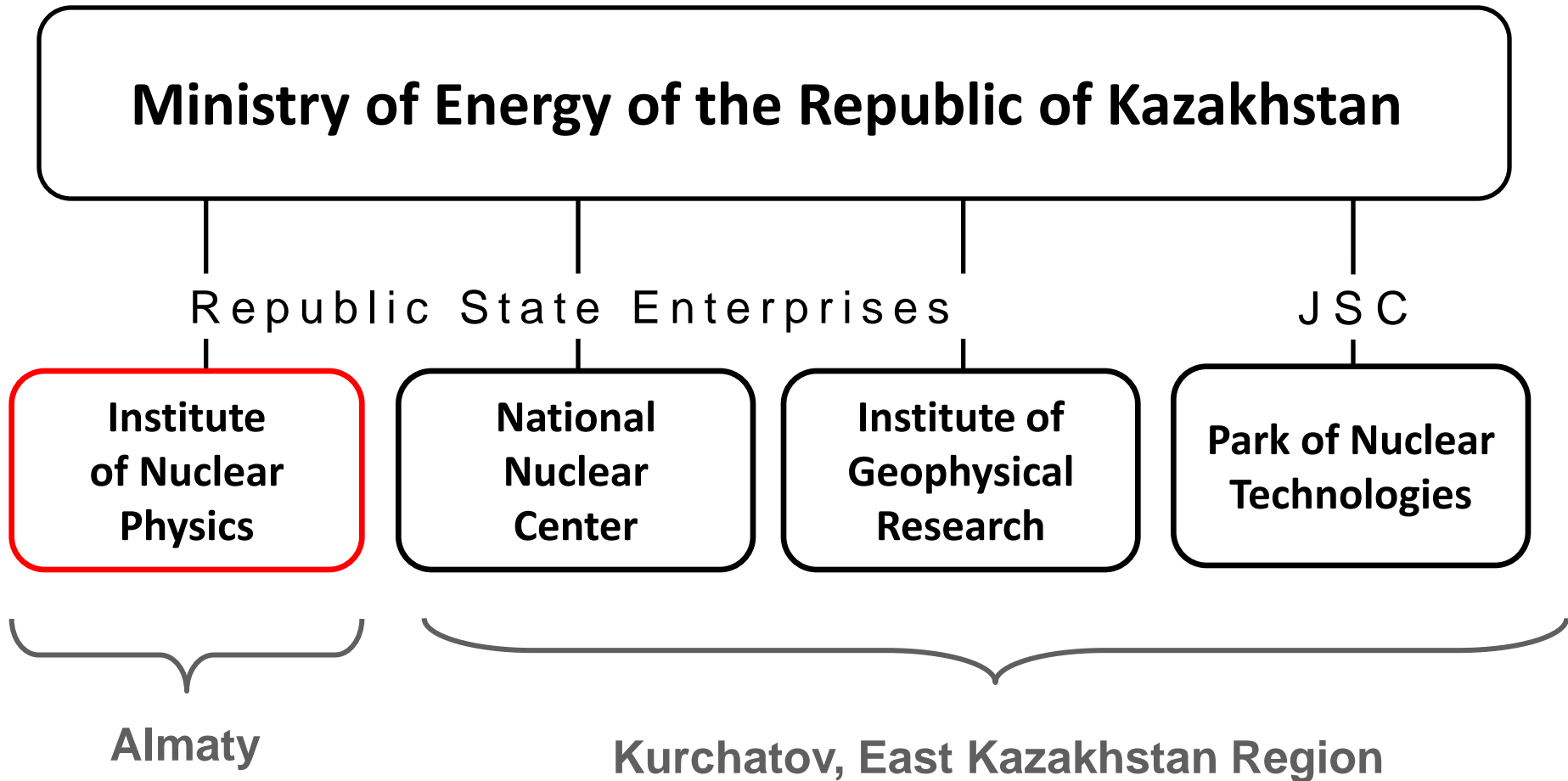
*Institute of Nuclear Physics of the Ministry of Energy
Republic of Kazakhstan*

Beijing, June 7-10, 2016



INSTITUTE OF NUCLEAR PHYSICS

in nuclear research infrastructure of Kazakhstan





INSTITUTE OF NUCLEAR PHYSICS

was established in 1957

Staff: 650 persons, including
70+ doctors and PhD

MAIN SITE:

- Alatau, 20 km far from Almaty

BRANCHES:

- Astana
- Aksay
- Azgir



INP BASIC FACILITIES

1957-1991



**Research Reactor WWR-K
and Critical Assembly**

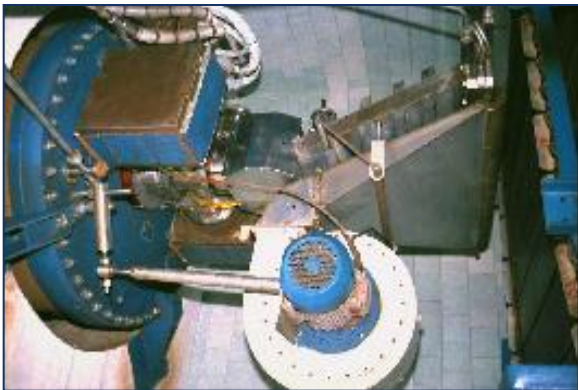


Cyclotron U-150M



**Linear Tandem Accelerator
UKP-2-1**

1992-2015



Electron Accelerator ELV-4



Heavy Ion Cyclotron DC-60



cyclotron Cyclone-30

PRIMARY R&D AREAS:

Nuclear Physics

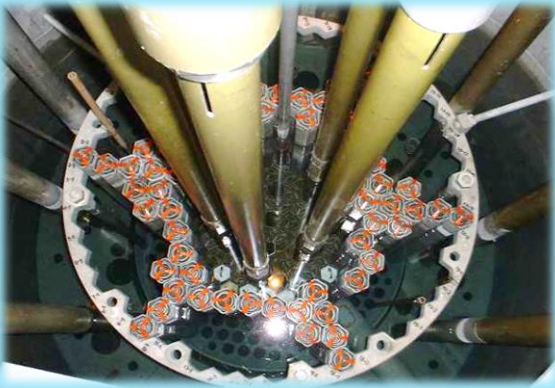
**Radiation
Physics of Solids**

**Nuclear Analytical
Techniques**

Radiochemistry

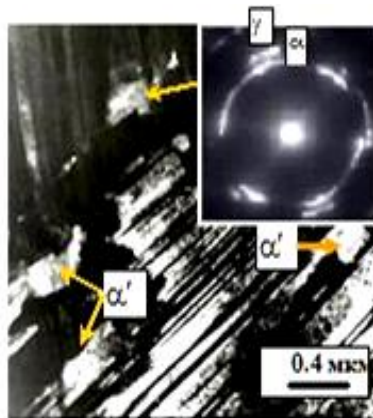
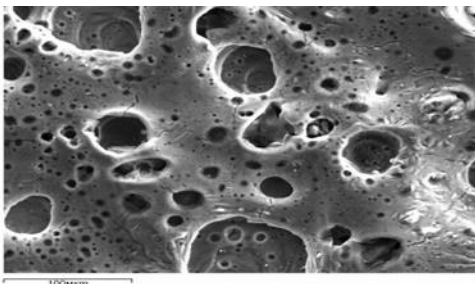
**Accelerator
Technologies**

**Reactor
Investigations**



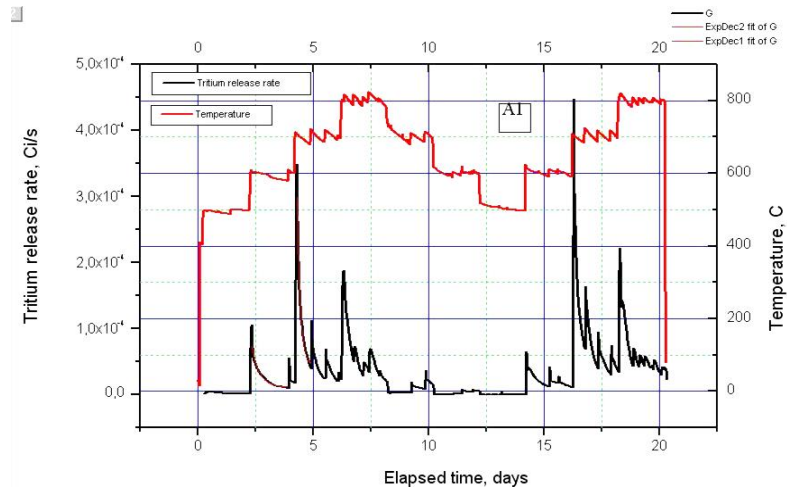
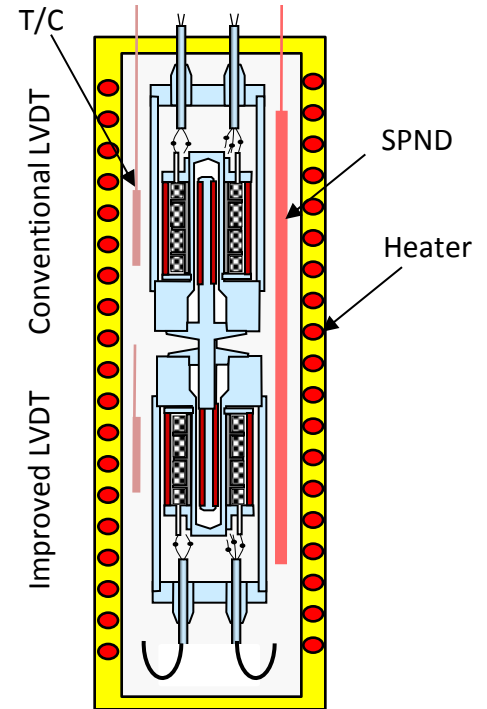
SOLID STATE PHYSICS

- Radiation physics of solids, computer simulation of radiation effects
- Radiation material science
- Ion beam modification of materials
- Ion-plasma synthesis of exotic alloys, superconductors, semiconductors
- Proton-conducting oxides
- Hyperfine interactions in investigations of surface layers



REACTOR INVESTIGATIONS

- Physics of nuclear reactors
- Nuclear safety
- Irradiation testing of nuclear materials and components
- Reactor technology for medicine and industry



RADIOECOLOGY

Complex radiological investigation of the contaminated territories, establishment of radiological monitoring systems

- 456 nuclear explosions at Semipalatinsk Test Site
- 32 nuclear explosions at other sites (including 23 at the sites currently controlled by INP)
- BN-350 fast breeder reactor (under decommissioning)
- 5 research reactors and critical assemblies, 4 operating, 2 in INP
- Uranium mining and processing
- Natural radionuclides from petroleum production

Radiation and hydro-chemical monitoring of the trans boundary rivers. INP operates the largest and high-performance radionuclide analysis laboratory in the region

Development and application of the technologies for cleanup of the contaminated territories and equipment



TECHNOLOGIES FOR INDUSTRY AND MEDICINE

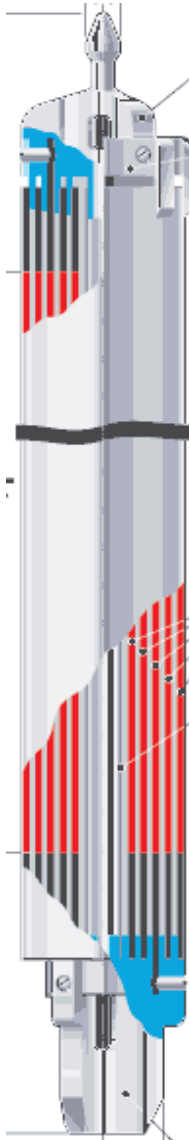
Radioisotopes production and application

Radiation processing and radiation sterilization

Nuclear-physical methods of analysis



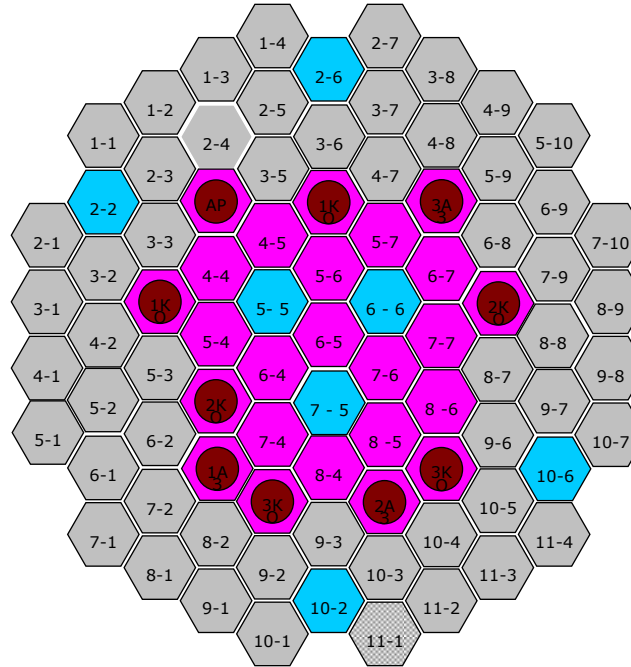
WWR-K REACTOR CONVERSION TO LEU FUEL



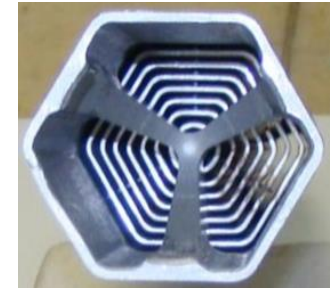
U-235
36%



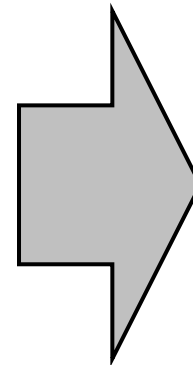
5-tube fuel assemblies
UAl₄-Al
Water reflector
1·10¹⁴ n/(cm²s)



U-235
19.7%



8-tube fuel assemblies
UO₂-Al
Beryllium reflector
2·10¹⁴ n/(cm²s)

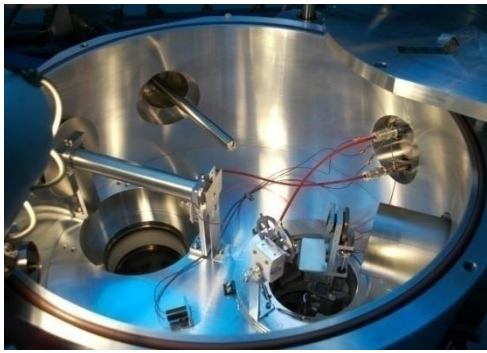


INP INTERNATIONAL COLLABORATION

- **R&D:**
 - Basic nuclear physics
 - Material science
 - Radioecology
 - Radioisotopes
 - Ion-track membranes
- **HEU minimization, conversion to LEU**
- **Nuclear Security**
- **Education and Training**

-
- **Research institutions in CIS, Europe and Japan**
 - **US national laboratories and universities**
 - **International Atomic Energy Agency**
 - **Joint Institute of Nuclear Research (Dubna)**
 - **International Science and Technology Center**
 - **Forum for Nuclear Cooperation in Asia**
 - **Asia-Pacific Center of Theoretical Physics**





EXPERIMENTAL NUCLEAR PHYSICS

- Investigations of nuclear reactions mechanisms and structure of light and mean nuclei in the range of low and mean energies
- Investigations of exchange reactions and radioactive capture for astrophysical applications and thermonuclear fusion
- Investigations of inclusive cross-sections of nuclear reactions, related to development of accelerator-driven nuclear systems (ADS)
- Investigation of trans-uranium elements fission

INP Directorate

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graph TD; A[INP Directorate] --> B[Nuclear Physics Department]; B --> C[Laboratory of Nuclear Processes]; B --> D[Fission Physics Laboratory]; B --> E[Laboratory of Low Energy Nuclear Reactions]; B --> F[Laboratory of Theoretical Nuclear Physics];
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Nuclear Physics Department

**Laboratory of
Nuclear
Processes**

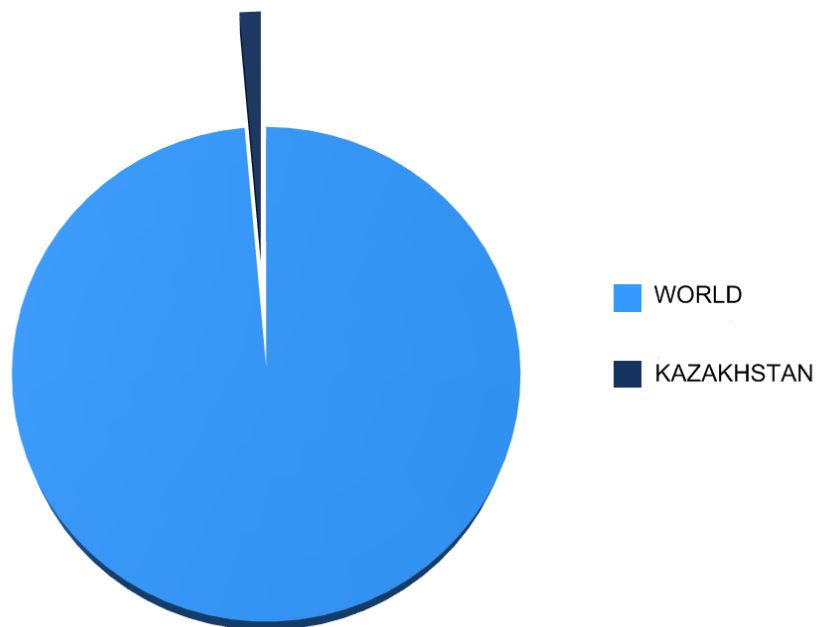
**Fission Physics
Laboratory**

**Laboratory of
Low Energy
Nuclear
Reactions**

**Laboratory of
Theoretical
Nuclear Physics**

The number of publications of the Kazakhstan physicists on nuclear physics in Thompson Reuters editions (2011-2015 гг.)

1,4 %

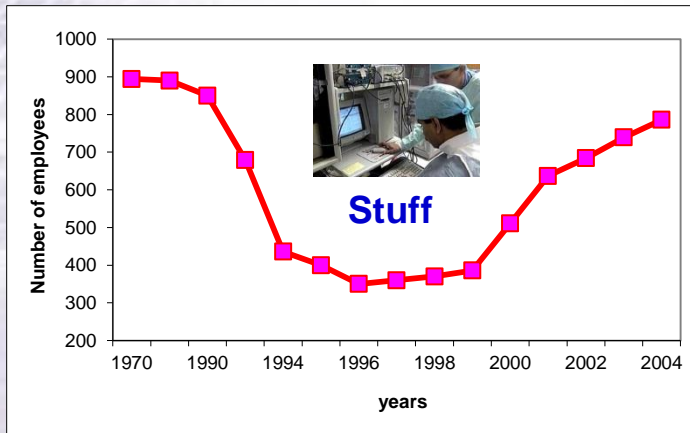
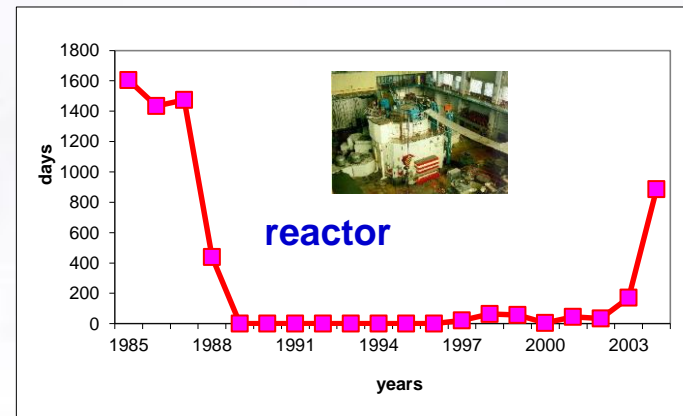
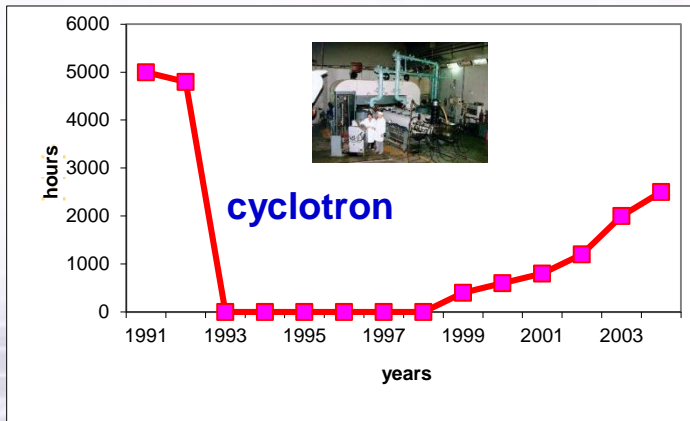


Hirsh's index of the leading scientists of INP in the field of nuclear physics

Rusanov A.Y.	19
Burtebayev N.	8
Pen'kov F.M.	9
Zhdanov S.V.	8
Mulgin S.I.	12
Duysebaev A.	6

INP Hirsh's index is 21 and due to nuclear physicist

THE PERIOD OF STAGNATION



Possible contribution of Institute of Nuclear Physics to EXFOR compilation

- **to provide the experimental numerical data newly published in scientific journals in timely manner**
- **to provide access to reports published by Institute of Nuclear Physics**
- **to search the authors experimental data which were measured earlier.**

Number of Kazakh author's articles placed in EXFOR

Author's data 53
Digitized 20

this is not a complete data

Experimental data on nuclear reaction in INP are obtained on the following basic facilities

- Isochronous cyclotron U-150 M
- Accelerator Complex DC-60
- Electrostatic recharging accelerator UKP-2-1
- Research nuclear reactor WWR-K (**laboratory was closed**)
- Neutron d-t generator (**decommission**)

The statistics during 2011-2015 years about INP articles from Thompson Reuter's base

2011	2012	2013	2014	2015
4(2)	3(2)	3	3(2)	5(2)

TOTAL – 18 ARTICLES
Not included in EXFOR – 8 ARTICLE

Articles which were not included in EXFOR

1. S.B.Dubovichenko et al., Physics of Atomic Nuclei. - 2011. - Vol.74. – P.984.
2. Hamada Sh., Burtebayev N. et al, Physica Scripta. - 2011. - Vol.84. – 045201.
3. Amar A., Hamada Sh., Burtebayev N. et al, Int. Journal of Modern Physics, Part E, . - 2012. - Vol.20. – Issue 4 – P.980.
4. Hamada Sh., Burtebayev N. et al, Journal of Physics: Conference Series. - 2012. - Vol.381. – 012130.
5. Sakuta S., Burtebayev N. et al, Acta Physica Polonica, Part B. - 2014. - Vol.45. – P.1853.
6. Hamada Sh., Burtebayev N. et al, Int. Journal of Modern Physics, Part E, . - 2014. - Vol.23. – 1450061.
7. Burtebayev N. et al., Journal of physics: conference series - 2015. - Vol.590. – 012055.
8. Burtebayev N. et al., Journal of physics: conference series - 2015. - Vol.590. – 012056.

- to provide access to reports published by Institute of Nuclear Physics

The statistics during last 5 years about INP articles which were published in Kazakhstan journals

2011	2012	2013	2014	2015
3	0	3	3	2

TOTAL – 11 ARTICLES
relevant to EXFOR - the analysis

Articles which were issued in Kazakhstan journals

1. Zholdybayev T.K. et al., Bulletin of NNC RK – 2011. – Iss. 3. – P.82-86.
2. Kerimkulov Zh. et al., Bulletin of KazNu – 2011. – Iss. 4. – P.40-50.
3. Kerimkulov Zh. et al., Bulletin of KazNu – 2011. – Iss. 4. – P.51-64.
4. Duisebayev A. et al., Bulletin of NNC RK – 2013.- Iss.1.- P. 18-23.
5. Burtebayev N. et al, Bulletin of NNC RK – 2013. – Iss.1. – P.9-17.
6. Дуйсебаев А. et al., Bulletin of KazNu – 2014. – Iss. 1. – P.30-38.
7. Burtebayev N. Izvestia NAN – 2014. – Iss. 2. – P.61-65.
8. Duisebayev A. et al., ., Reports of 9th International conference «Nuclear and radiation physics».- Almaty, 2014.- P.233-237.
9. Duisebayev A. et al., Reports of 9th International conference «Nuclear and radiation physics».- Almaty, 2014.- P.237-241.
10. Дуйсебаев А. Et al., Bulletin of KazNu – 2015. – Iss. 4. – P.68-79.
11. Дуйсебаев А. Et al., Bulletin of KazNPU – 2015. – Iss. 3. – P.153-158.

Articles which were issued in Kazakhstan journals

The basic domestic journal with open access website is:

Bulletin of KazNU <http://bph.kaznu.kz/index.php/zhuzhu>

Bulletin of NNC <http://www.nnc.kz/zhurnalvestnik.html>

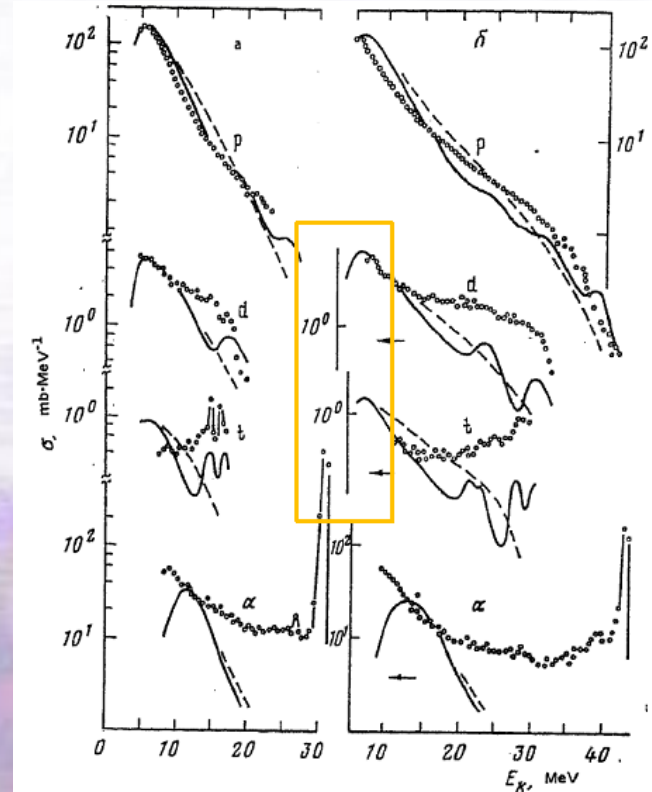
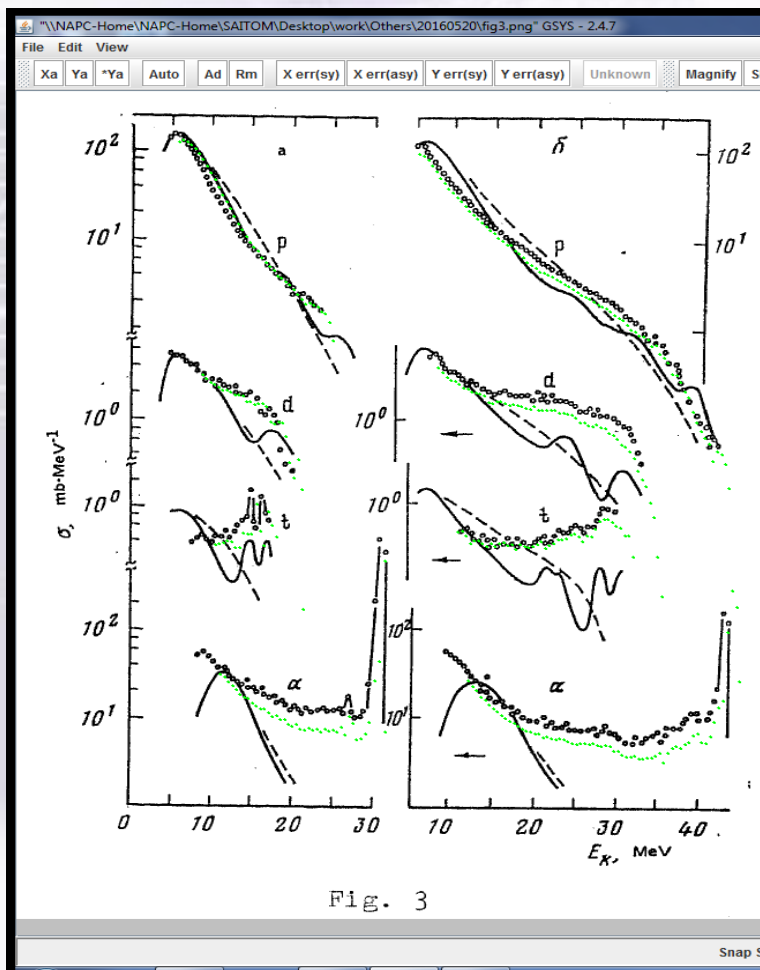
Bulletin of ENU

<http://repository.enu.kz/handle/123456789/8>

It is possible to trace an issue of new articles by timely manner.

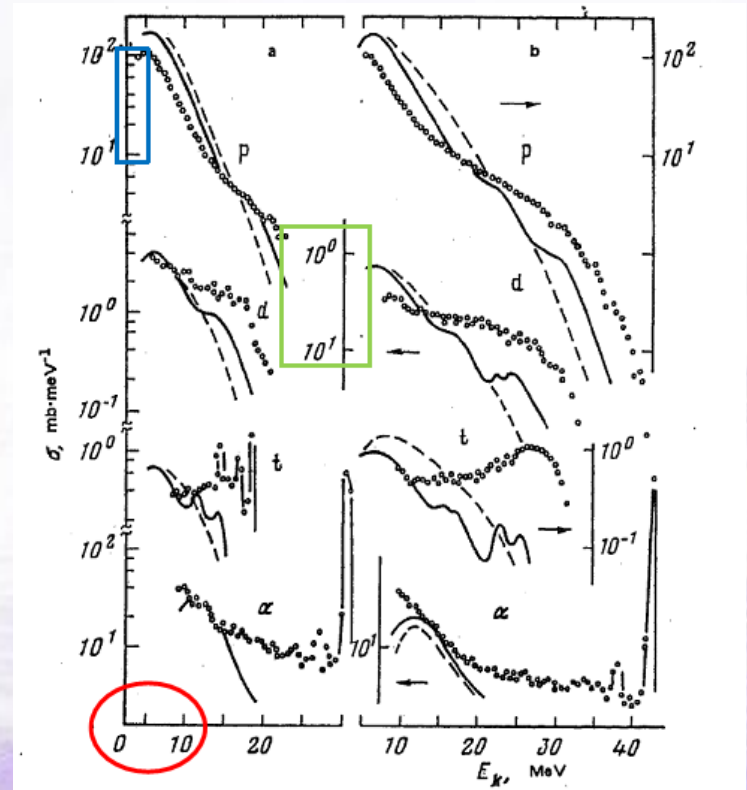
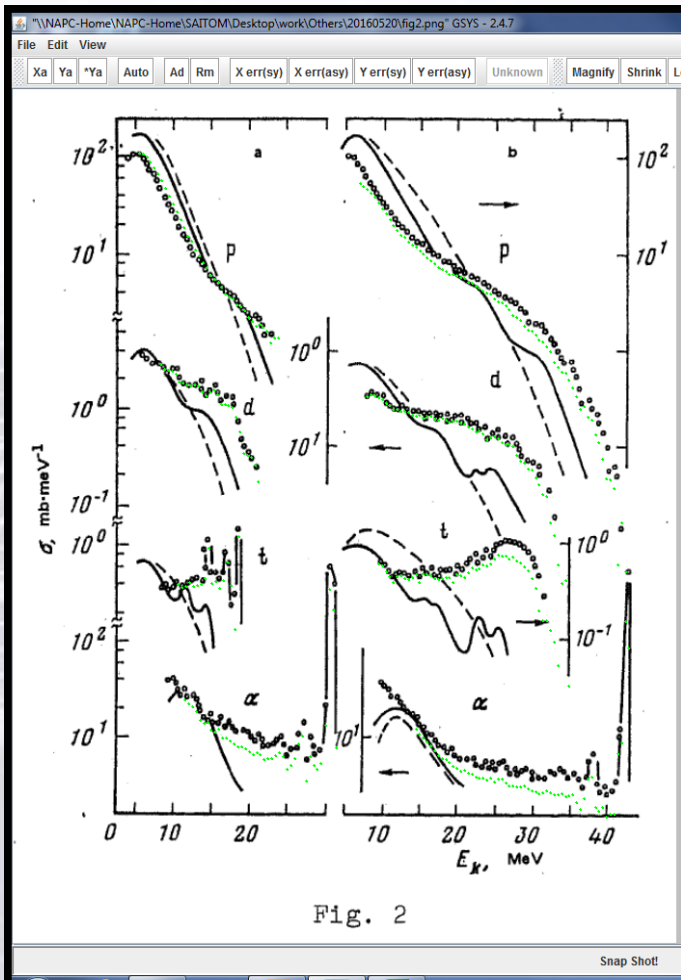
to search the authors experimental data

Numerical data N.T.Burtebaev et al., Izv. Akad. Nauk SSSR, Ser. Fiz. 44, 2426 (1980) were provided to Dr. Otsuka as per his request



courtesy of Ms. Saito, JCPRG

to search the authors experimental data



courtesy of Ms. Saito, JCPRG

This lesson shows that it is almost impossible to perform meaningful digitization from this figure, and author's numerical data are very essential! (Dr. Otsuka)

Welcome
to ALMATY on middle of June 2017
To International Conference
“Nuclear and Radiation Physics”
Deduced to 60th anniversary of INP

**Thank you
for your attention!**