

WORK PLAN FOR THE CO-OPERATION IN NUCLEAR RESEARCH

BETWEEN

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AND

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Introduction

In order to develop the tradition of co-operation and of scientific / technical assistance of the Hungarian Republic to the Vietnamese Socialist Republic, the **Institute of Isotopes of the Hungarian Academy of Sciences (IKI)** and the **Vietnam National University, Hanoi (VNU)** present a work plan for co-operation in the field of nuclear research.

The **Institute of Isotopes of the Hungarian Academy of Sciences (IKI)** was founded in 1959 with the task of serving as a national institute for the production and application of radioisotopes in research, medicine, industry and in everyday life. One of the basic research fields is the study of nuclear reactions induced by photo- and neutron excitation. Nowadays an important task of the Institute is to provide the scientific foundation and to develop the methodology for the verification of the compliance with the treaty on non-proliferation of nuclear weapons. The above noted research is mainly carried out by the **Radiation Safety Department** and the Nuclear Research Department, which are two of the five scientific Departments of IKI. Vietnamese Researchers are welcome to work in IKI for a short period time in order to exchange scientific ideas and develop their scientific careers.

Vietnam National University, Hanoi (VNU) has 10 colleges and faculties. Throughout its history the university has had several name changes: the **University of Indochina** (established in 1906); **Vietnam National University** (November, 1945); the **University of Hanoi** (June, 1956). In 1993, Vietnam National University, Hanoi was created by merging the Hanoi University of Sciences, Hanoi University of Education and College of Foreign Languages. VNU has the task of basic research and training high quality human resources and scientific-technological talents for the country. Basic research in the field of nuclear science and training researchers for the atomic energy industry is nowadays one of the main tasks of the **Nuclear Department** (Physics-research Department, Hanoi Nature Scientific University of Vietnam National University, Hanoi (VNU)).

Within the framework of the present work plan, IKI (**Radiation Safety Department**) will assist VNU (**Nuclear Department**) in setting up and carrying out its training programs and projects in the field of nuclear physics. This work plan is valid from October 1st, 2009 to December 31st, 2012.

Co-operation topics

- 1- Photoexcitation of isomers of stable nuclides using X-rays, high activity ^{137}Cs , ^{60}Co sources and accelerator bremsstrahlung: reaction mechanisms, new nuclear data for nuclear spectroscopy and stellar nucleosynthesis, effect of Compton scattering inside the gamma excitation sources and influence of sample thickness on the precision of experimental nuclear data
- 2- Application of high-resolution gamma-spectrometry for the non-destructive assay of nuclear materials (in particular, Uranium and Plutonium): Nuclear safeguards, Combating illicit trafficking of nuclear materials and Nuclear forensics
- 3- Neutron coincidence counting
- 4- Assay of fresh and spent fuel assemblies in nuclear power plant

Contents of co-operation

1. VNU's researchers take part in measurements and in developing the method for analyzing the experimental data in the field of photoexcitation of isomers of stable nuclides in IKI (topic 1).
2. IKI assists VNU to for setting up the measurements for studying (gamma, gamma') nuclear reactions at VNU (topic 1).
3. IKI assists VNU to implement high-resolution gamma-spectrometry for the non-destructive assay of nuclear materials for training purposes (topic 2).
4. IKI assists VNU to build a model neutron coincidence counter for research and training (topic 3).
5. VNU's researchers take part via IKI in developing the method for analyzing experimental data from measurements at a nuclear power plant (topic 4).
6. Every year, one young researcher from VNU will work in IKI for a period of one year and two researchers from IKI will work in VNU for a shorter time (1-2 weeks-2 months).

Expected results of co-operation

1. The new methods for analyzing the experimental data and the new nuclear data will be reported in the form of peer-reviewed scientific publications. That is useful for both IKI and VNU.
2. The research in the field of photoexcitation of isomers of stable nuclides will be established in VNU.
3. The techniques for characterizing nuclear materials (Uranium and Plutonium) will be implemented for training purposes in VNU.

4. VNU's researchers will have the opportunity to take part in research related to the operation of the reactor of a nuclear power plant.

Plan for 2009

1. October 2009, Prof. Dr. Arpad Veres and Dr. Nguyen Cong Tam from IKI will work in VNU for two weeks
2. Preparation for one VNU's young researcher to work in IKI in 2010.
3. Joint review of experimental data measured in IKI for Os and In isotopes and development of a model to be used by Monte Carlo simulations for analyzing the experimental data.
4. Preparing the plan for 2010.

IKI will support this work plan in order to strengthen the research efforts in VNU. IKI will give salary for one young researcher of VNU for 3 years (or three young researchers of VNU for one year). Also, IKI will cover travel expenses for IKI researchers to Vietnam and back.

On this occasion VNU thanks IKI for help in setting up and carrying out the co-operation work plan. VNU will cover accommodation and staying expenses for two researchers of IKI .

IKI and VNU hope that the plan will be successfully performed and that the co-operation will be continuously extended in the future.

This work plan is valid from October 1st, 2009 to December 31st, 2012 and is renewed or extended upon expiration through consultation and mutual agreement

Director of IKI

Director of VNU