Some results of the VNIIM Activity in the Field of Neutron Measurements. 2001 – 2003

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In 2001- 2003 the main efforts of neutron measurements group of VNIIM have been concentrated on improving of the standard equipment and techniques for neutron sources and fields parameters measurements.

In connection with structural transformations being done at the institute, we had to spend a significant part of time and forces to redislocation of some equipment. The "Mn-bath" was moved to another room. The facility providing the standard field with a constant fluence rate of thermal neutrons and the complex of the equipment for investigating characteristics and calibrating of thermal neutron detectors were moved into another building, The new complex of equipment for calibrating of neutron radiometers and dosimeters was designed and manufactured.

A research cycle for determining the interaction parameters of fast neutrons with carbon and the distribution of thermal neutrons for the sources with different spectra at the long-dimension graphite moderator were continued.

To measure the neutron source strength at calibrating laboratories, we have developed a portable radiometer-comparator that makes possible to compare both the neutron source strength and the mean energy of neutrons with a sufficient accuracy.

The laboratory goes on to participate in CCRI(III) key international comparisons. We pre-pared our report on fast neutron fluence rate measurements according to the CCRI(III)-K10 key comparison program. This report was sent to the comparison coordinator. Some time later on, we updated this report following to coordinator's remarks. Now we try to clarify the reasons of an essential discrepancy of our result for energy 14.8 MeV from results of other participants.

The problem of participation of VNIIM in ***EUROMET #608*** project (key comparison for the calibration of ambient dose equivalent meters in ISO neutron reference fields) was considered with the project coordinator. To make our participation at this project significant we carried out a number of experiments to estimate the influence of the uncertainty of detector sensitivity spectral dependence on the dose equivalent measurement uncertainty. A combined source "***(Cf +D2O)/Cd***" was designed and produced.

To accept a decision with regards to the opportunity of VNIIM to participate in CCRI(III)-K8.B10 key comparison we simulated a quasidirected beam of thermal neutrons with a fluence rate of about $1.5 \cdot 10^3 s^{-1}$ and neutron temperature of (298±5) K.

The VNIIM CMC tables for the neutron measurements area were made and sent to experts. The responses on the COOMET and APMP expert's remarks were prepared and sent them back.

One of the main directions of the laboratory activity is testing of new types of the measurements means produced by Russian and foreign enterprises. During last

two years we were carrying out tests of a scintillation spectrometer intended to make measurement in mixed gamma - neutron fields which was developed and produced by St.-Petersburg enterprise "JAFI", a set of the bubble-detectors developed and produced by the Moscow enterprise "RADON", the complex of means for measuring of neutron fields parameters in sea water, developed and produced by the ship-building company "Krylov Institute", the multi-purpose device SRK-AT2327 developed and produced by Belarusian enterprise "ATOMTECH".

A significant part of the activity executed in 2001 – 2003, is connected with the safety assurance of nuclear objects that are in operating or being built now. In particular, certification of secondary standards is executed for the following enterprises:

- secondary standard of thermal neutron field, being used for the quality control of nuclear power station safety systems at the I.V.Kurchatov Institute;
- standard complex of measurement means, being used to provide atomic fleet safety at the Defence Ministry research centre;
- standard complex of measurement means, being used to provide radionuclide products quality at the Atomic Reactors Institute.

Moreover, the laboratory participated in the ISTS project "Development of a Combined Device for the Detection of Unauthorized Transportation of Explosive, Fissionable and Radioactive Materials".

The problem of creating such a device using the neutron-activation method was the aim of this project.

We carried out an experimental investigation of thermal neutron field shaper parameters (fluence rate, neutron temperature, fast neutron contribution, gamma-radiation intensity) and calibrating and tests of dosimetric devices.