# TESTING OF ROSFOND-2020.2 NUCLEAR DATA FOR USE IN PRACTICAL CALCULATIONS

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## Introduction

A new version of constant software which based on new domestic library of nuclear data files – ROSFOND-2020.2 was created in IPPE by modernizing of neutron data files – ROSFOND-2010[1], taking into account the results of the work of the international CIELO and JEFF groups under the auspice of the IAEA, new experimental data, analysis of new estimates of cross sections from the domestic library BROND-3.1[2] and foreign libraries ENDF/B-7 and 8, JEFF-3.3, TENDL-21.

## ROSFOND-2020.2 database

The ROSFOND-2020.2 nuclear database includes the following sub-libraries (sections) of various purposes:

1. "NEUTRON NUCLEAR DATA SUBLIBRARY" – 718 FILES.
2. "FISSION PRODUCT YIELDS SUBLIBRARY" – 31 FILES.
3. "PHOTOATOMIC NUCLEAR DATA SUBLIBRARY" – 100 FILES.
4. "PHOTONUCLEAR NUCLEAR DATA SUBLIBRARY" – 222 FILES.
5. "RADIOACTIVE DECAY NUCLEAR DATA SUBLIBRARY" – 3691 FILES.

The neutron data library contains 691 general-purpose nuclide files (for nuclei from hydrogen to fermium) and includes new estimates and data from other sources, including:

a) data obtained as a result of the "ЕОТП ДКЯЭ-229" work and accepted on the basis of analyses from the BROND-3.1 library of nuclear data files for
   - fuel materials uranium-235, 236, 238, plutonium-239, 240, 241;
   - coolant and structural materials H, O, Na, Pb, Bi, isotopes of Fe, Cr, Ni and other;
   - fission products Tc, Ru, Rh, Pd and a number of other.;
   - actinides Np-237, Pu-238, Am-241, 242, 243, isotopes of Cm.

b) accept on the basis of analysis from the library of ROSFOND-2010 files,

c) obtained within the framework of the international groups CIELO [3] and JEFF,

d) accepted on the basis of analysis of foreign libraries ENDF/B-7.1, 8.0 and 8.1, TENDL-21.

The ROSFOND-2020.2 nuclear database is a part of the constant software used in program codes and complexes designed for the calculations of fast reactors, radiation shielding and closed nuclear fuel cycle. The use of ROSFOND-2020.2 data in neutron-physics calculations is carried out under the control of Monte-Carlo computer programs: MCNP, MMKKENO, MMKC, MCU, SERPENT, etc.

## Results of test calculations

At present, ROSFOND-2020.2 data have been reworked into working formats:

– ACE format – for use in Monte-Carlo calculations;

– WIMS format – for calculations in the multigroup approximation (69 and 172 groups), using the deterministic WIMS program (FCP or DSN method);

– MATXS format of group constants – for calculations in the multigroup approximation (299, 200 and 48 groups), using the deterministic TWODANT program (DSN method).

Comparative calculations of actinide depletion accumulation were performed using the WIMS program with constants in different group energy breakdowns in 69 and 172 groups and MCNP program with detailed cross sections in ACE format with burnup modules CINDER90 and ORIGEN2. We compared the calculations of actinoid concentrations with the ROSFOND-20202.2 data using the WIMS program with constants in the 172 group energy breakdown and MCNP with the ORIGIN2 burnup module [4].

Using the created library NP200/47 (200 neutron groups and 47 photon groups) and created library NP48/20 (48 neutron groups and 20 photon groups) matxs-libraries of constants of OKB "GIDROPRESS" the created libraries were tested by different programs in calculations of benchmark-experiments k-eff from ISCBEP Handbook (the results are present in the joint article).

The matxs-libraries were also tested in radiation safety calculations by variable models:

– Sphere of different thicknesses of iron or lead with a $^{252}Cf$ source in the center;
– benchmark ASPIS from database SINBAD;
– one-dimensional radial model of fast reactor.

Comparative calculations have been performed both in the group approach using the CONSYST/BNAB-RF complex and by the Monte-Carlo Method using detailed energy dependences of cross sections.

## References


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