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Andrew M. Holcomb,
Steven van der Marck,
Andrej Trkov,
Oscar Cabellos

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Automated Conversion of International Criticality Safety Benchmark Models: Developing a Reproducible Serpent-2 Model Repository from MCNP Inputs

Working Party on International Nuclear Data Evaluation Co-operation

Andrew M. Holcomb
Nuclear Energy Agency (NEA)

Steven van der Marck
Nuclear Research and Consultancy Group (The Netherlands)

Andrej Trkov
Jozef Stefan Institute (Slovenia)

Oscar Cabellos
Universidad Politecnica de Madrid (Spain)

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Foreword

The Serpent-2 software is a three-dimensional continuous-energy neutron and photon transport code, developed at the Technical Research Centre of Finland (VTT) (Leppänen, 2015), and is one of the most requested software programs from the Nuclear Energy Agency Data Bank (NEA DB). The NEA Data Bank also facilitates the production and distribution of the Joint Evaluated Fission and Fusion (JEFF) Nuclear Data Library (Plompen et al., 2020), a collaborative effort among its member countries to provide evaluated nuclear data libraries for a variety of fission and fusion applications. More broadly, the NEA supports international nuclear data collaboration between its member countries through the Working Party on International Nuclear Data Evaluation Co-operation (WPEC), providing a framework to promote the exchange of information on nuclear data evaluations, measurements, nuclear model calculations, validation, and related topics between the evaluation projects such as the Evaluated Nuclear Data File (ENDF) (Brown et al., 2018) , the Japanese Evaluated Nuclear Data Library (JENDL) (Iwamoto et al., 2023), JEFF project, the Chinese Evaluated Nuclear Data Library (CENDL) (Ge et al., 2020), the TALYS-based Evaluated Nuclear Data Library (TENDL) (Koning et al., 2019), and in close co-operation with the Nuclear Data Section of the International Atomic Energy Agency (IAEA). Additionally, the NEA is responsible for the International Criticality Safety Benchmark Evaluation Project (ICSBEP), which is a collection of critical and subcritical benchmark experimental data in a standardised format that allows criticality safety analysts to validate calculation tools and cross-section libraries (NEA, 2020).

Recognising the unique collection of information and expertise housed at the NEA, a Serpent-2 model repository was launched, focusing on the automatic generation of Serpent-2 models of ICSBEP models from existing sets of validated MCNP input repositories (Werner et al., 2017). This document details the process used to automatically and reproducibly convert MCNP inputs into Serpent-2 inputs and compares the results between the original and generated inputs. Future work should focus on continuing to expand the coverage of application areas, as well as to remove certain limitations hindering the accuracy of some models.

Acknowledgements

The primary author expresses his sincere gratitude to the efforts of the csg2csg team; without this software as a jumping off point, this work would have been much more difficult and time consuming. He would also like to acknowledge the documentation efforts of the Serpent-2 team, whose Wiki proved invaluable in troubleshooting and understanding the use of their software.

Special thanks are also due to Daniela Foligno and Julia Sprenger (NEA Data Bank), who supported the production of this Working Paper and responded to questions.

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List of abbreviations and acronyms

CENDL	Chinese Evaluated Nuclear Data Library
DICE	Database for the International Handbook of Evaluated Criticality Safety Benchmark Experiments
ENDF	Evaluated Nuclear Data File
FENDL	Fusion Evaluated Nuclear Data Library
HEU	High-Enrichment Uranium
IAEA	International Atomic Energy Agency
ICSBEP	International Criticality Safety Benchmark Evaluation Project
IEU	Intermediate-Enrichment Uranium
IRPhE	International Handbook of Evaluated Reactor Physics Benchmark Experiments
JEFF	Joint Evaluated Fission and Fusion
JENDL	Japanese Evaluated Nuclear Data Library
LCT	Low-enrichment composite thermal
LEU	Low-enrichment uranium
NEA	Nuclear Energy Agency
NEA DB	Nuclear Energy Agency Data Bank
NRG	Nuclear Research and Consultancy Group
OECD	Organisation for Economic Co-operation and Development
pcm	percent-milli (0.00001)
QA	Quality assured
SFCOMPO 2.0	Spent Fuel Isotopic Composition
SINBAD	Shielding Integral Benchmark Archive and Database
TENDL	TALYS-based Evaluated Nuclear Data Library
TSL	Thermal scattering law
UPM	Universidad Politécnica de Madrid
VaNDal	Validation of Nuclear Data Libraries
VTT	Technical Research Centre (Finland)
WPEC	Working Party on International Nuclear Data Evaluation Co-operation (NEA)

Executive summary

This document presents the development and testing of a suite of Serpent-2 models for cases drawn from the International Criticality Safety Benchmark Evaluation Project (ICSBEP). The models were generated by automatically converting existing MCNP models using the csg2csg tool and additional custom Python scripts, ensuring a reproducible and automated process. The models were drawn from validated MCNP inputs contributed by the Nuclear Research and Consultancy Group (NRG), the International Atomic Energy Agency (IAEA), and the Universidad Politécnica de Madrid (UPM).

The purpose of this work is to create a comprehensive, reproducible repository of Serpent-2 models that closely align with the original MCNP inputs, allowing for consistent benchmarking, validation and nuclear data testing. The suite includes over 2 500 fully functional models with an additional ~1 900 models that, while not fully functional due to technical limitations, provide a valuable starting point for further refinement.

The conversion process leverages Python scripts to address key issues in the initial automated translation, including material definitions, bounding surface corrections, and the addition of thermal scattering law data. The models in the suite cover a broad range of different ICSBEP systems, including those with fissile drivers of high-enrichment uranium (HEU), intermediate-enrichment uranium (IEU), low-enrichment uranium (LEU), mixed uranium/plutonium, plutonium only, "special" material (^{237}Np), and ^{233}U. The configurations also cover many different fissile forms such as compound systems, metal systems, solution systems, and so called "miscellaneous" systems. The suite also covers a variety of thermal, intermediate, fast and mixed spectra systems. Results show that the Serpent-2 models generally produce results statistically equivalent to the original MCNP models when using the same nuclear data.

The work identifies specific limitations in the Serpent-2 models, particularly related to missing thermal scattering law (TSL) data and boundary conditions, which lead to discrepancies in some cases. These limitations, though significant, can be resolved through future updates, adjustments, or manual intervention, enabling continued improvement in the repository.

This project demonstrates the value of automated model generation for nuclear data validation and highlights the importance of transparency, reproducibility and community collaboration. Future efforts are encouraged to extend this process to other codes (e.g. SCALE, OpenMC) and application areas. Additionally, further studies should focus on the consistency of input data, model verification across different contributors, and methodologies to address discrepancies in the benchmark results.

The repository created as part of this work serves as a critical resource for nuclear data evaluation projects and supports the broader goals of the Nuclear Energy Agency (NEA) in enhancing international collaboration and benchmarking capabilities. Access to the input repository is automatically granted to users who request and are approved for both the ICSBEP Handbook and the Serpent-2 code through the NEA Data Bank.

1. Introduction

Andrew M. Holcomb, Steven van der Marck, Andrej Trkov, Oscar Cabellos

This paper presents the development and testing of Serpent-2 models of a variety of International Criticality Safety Benchmark Evaluation Project (ICSBEP) benchmarks. The initial models were generated using the csg2csg tool and MCNP inputs provided by Steven van der Marck (Nuclear Research and Consultancy Group [NRG]), Andrej Trkov (formerly of the International Atomic Energy Agency [IAEA]), and Oscar Cabellos (Universidad Politécnica de Madrid [UPM]). A set of Python scripts were written to augment the output of the csg2csg tool to create a set of working inputs. This included standardisation of the naming conventions to match the ICSBEP handbook. Some important aspects of the Serpent-2 model generation include the transparency, automation and reproducibility of the process. Currently, there are 1 194 functional Serpent-2 inputs in the IAEA set, 1 277 inputs in the NRG set, and 112 inputs in the UPM set (for a total of 2 583 inputs). There are another 1 888 inputs that are not fully functional but can used as a starting point to generate a working model.

1.1. Background

The goal of every nuclear data library evaluation project is to provide a curated set of fitted nuclear reaction data that combines experiments, theories and phenomenology to provide the most complete representation of the interaction physics. These libraries are essential for accurately modelling and simulating nuclear processes in various applications, including nuclear power generation (both fission and fusion systems), nuclear safety, radiation shielding, medical applications, and nuclear waste management.

The evaluation process involves collecting experimental data, theoretical calculations and expert assessments to ensure that the data in the library is accurate, complete, and consistent (including all relevant covariance data). This data is then validated through benchmarking against known experimental results to ensure its reliability for predicting real-world nuclear phenomena. The goal is to provide a robust and reliable set of application-agnostic nuclear data that can be used confidently in various technological applications (as previously mentioned).

The widely used nuclear data evaluation projects, such as JENDL (Iwamoto et al., 2023), JEFF (Plompen et al., 2020), ENDF (Brown et al., 2018), CENDL (Ge et al., 2020), and TENDL (Koning et al., 2019), all strive to deliver such comprehensive libraries. While the libraries are intended to be general purpose libraries, each version must be tested, benchmarked and validated for each application area. Historically, these benchmarking efforts were often fragmented, with multiple participants using different suites, leading to potential errors, misunderstandings and inefficiencies, such as time lost in correcting simple mistakes that could have been avoided with a more systematic approach. Additionally, differences in how each participant processed the nuclear data led to differences in the neutron transport results, even when using the same set of inputs and software versions.

To help address some of these challenges, the NEA has been responsible for facilitating the development, maintenance and distribution of valuable new resources. These include

international handbooks on criticality safety (ICSBEP) (NEA, 2020), reactor physics (IRPhE) (NEA, 2021), fuel burn-up (SFCOMPO 2.0) (Michel-Sendis et al. 2017), and radiation shielding (SINBAD) (NEA, 2024), which have undergone peer review and represent the best current understanding of the benchmark experiments used to validate nuclear data. These benchmarks are crucial for predicting neutron reactivity, criticality safety, radiation shielding, and particle transport, as well as for other applications like isotopic transmutation for waste disposal and dosimetry. In an attempt to leverage the efforts in these areas, the Working Party on International Nuclear Data Evaluation Co-operation's (WPEC) SG-45 (VaNDaL) was formed to focus on: (1) creating a methodology to compile Quality Assured (QA) versions of these inputs for transport codes (such as MCNP, SCALE [Wieselquist and Lefebvre (eds.), 2023], MVP [Nagaya et al., 2017], Serpent-2, etc.); (2) establishing a repository for the main input collections and beginning the QA process; and (3) developing tools to standardise and harmonise the extraction of information from these validation tests.

One of the most significant accomplishments of VaNDaL was the collection of several independent sets of MCNP models of ICSBEP benchmark cases from the NRG, IAEA and UPM; it should be noted that significant contributions were made for other code systems, such as MVP, but that is not the focus of the work here. The NRG suite contained nearly 2 600 inputs, the IAEA suite also contained nearly 2 600 inputs, and the UPM suite contained nearly 120 inputs (a subset colloquially referred to as the “Mosteller” suite).

Recognising the significance of these contributions, the needs of NEA Data Bank members, and the NEA’s role in supporting both the JEFF project and WPEC, a comprehensive suite of Serpent-2 inputs was created for ICSBEP models based on the MCNP contributions received under WPEC SG-45. Further, a set of Serpent-2 inputs was created that follow the scientific and engineering principles of automation, reproducibility and verification. The Serpent-2 models presented in this work (and housed in an NEA GitLab repository) were created automatically via existing tools and supplementary Python scripts from the original MCNP inputs (providing the automation and reproducibility) and then the Serpent-2 inputs were verified against the results of the original MCNP inputs using the same nuclear data libraries and the released, production version of Serpent-2. This approach ensures not only that users will get statistically equivalent results (again supporting reproducibility) but that users can also apply the same transparent process to their own inputs to expand the repository (further supporting and promoting collaborative efforts between NEA members).

2. Procedure

This chapter outlines the process used to generate the Serpent-2 ICSBEP benchmark models. It is worth noting that there is nothing unique or peculiar about the original MCNP inputs that enabled this work. Hence, the same process can (and should) be applied to other MCNP eigenvalue models in precisely the same way. There are of course some limitations which will be expanded upon later in the text.

The first step is to perform the initial conversion from MCNP to Serpent-2 by use of the "csg2csg" tool (Davis et al., 2021). The tool can perform translations of common Monte Carlo constructive solid geometry formats between each other; currently, it is able to read an MCNP input and then write a new MCNP, Serpent-2, and OpenMC model (Romano et al., 2015). The csg2csg tool currently supports only a subset of MCNP surfaces but detailing the limitations is out of the scope of this work and is well-documented on the csg2csg GitHub page; however, in the context of this work, it should be noted that transforms are not yet supported (including "LIKE" transformations) and that some lattices are translated but are not functional.

The command used to execute the initial conversion from MCNP to Serpent-2 is:

```
csg2csg -i ${inp} -f mcnp -o serpent
```

This instructs csg2csg to read the input (-i ${inp}) which is in MCNP format (-f mcnp) and to write out a Serpent-2 input file (-o serpent). As a concrete example, the MCNP model for the ICSBEP benchmark LST-002, case 2 might look like this:

```
Case 27.3-inch, Bare 1-D sphere, no impurities

c

c cell cards

1 1 9.8748e-2 -1 imp:n=1 $fuel

2 2 6.0317e-2 1 -2 imp:n=1 $Al sphere

3 0 2 imp:n=0 $outside system



c surface cards

1 so 34.4995

2 so 34.6583



mode n

kcode 100000 1.0 100 600
```

```
ksrc 0.0 0.0 0.0

c material cards

m1    92234.80c 2.5304e-7 92235.80c 6.1604e-5 92238.80c 1.1828e-3

      9019.80c 2.4893e-3 1001.80c 6.1683e-2 8016.80c 3.3331e-2

m2    13027.80c 5.96999E-02

      14028.80c 5.09128E-04

      14029.80c 2.57793E-05

      14030.80c 1.71126E-05

      29063.80c 3.55285E-05

      29065.80c 1.58355E-05

      25055.80c 1.48530E-05

mt1   lwtr.10t
```

The csg2csg command will create a file called “serpent/file.serp”:

```
% --- surface definitions --- %

surf 1 sph 0.0 0.0 0.0 34.4995

surf 2 sph 0.0 0.0 0.0 34.6583

% --- cell definitions --- %

cell 1 0 1 ( -1 )

cell 2 0 2 ( 1 -2 )

cell 3 0 void ( 2 )

% --- material definitions --- %

% M1

mat 1 0.098748 rgb 0 208 31

92234 2.562483e-06

92235 6.238509e-04

92238 1.197797e-02

9019 2.520862e-02
```

```
1001 6.246509e-01

8016 3.375361e-01

% M2

mat 2 0.060317 rgb 0 0 255

13027 9.897504e-01

14028 8.440712e-03

14029 4.273889e-04

14030 2.837057e-04

29063 5.890185e-04

29065 2.625330e-04

25055 2.462443e-04
```

There are a few things to note about the above Serpent-2 input:

1. The file is not functional:
    a. It is missing the extensions that specify the nuclear data to use (for example ".03c").
    b. It does not contain any neutron population parameters (which were present in the original file but were lost in translation) such as the number of neutrons per cycle, the number of cycles, or the number of skipped cycles.
    c. There is no "outside" but Serpent-2 requires that there is at least one region defined as "outside".
2. The conversion does not preserve any thermal scattering law (TSL) data specifications (material 2 should have TSL data applied for the ^{1}H-in-H_2O).
3. The conversion loses any comments present in the original file.

While point 3 is unfortunate, it does not prevent the Serpent-2 input from being usable, so the point further will not be discussed. To address the issues under point 1, Python scripts were written to specify the nuclear data used, add the neutron population parameters, and create the required bounding "outside" region. The scripts can be launched in any order, but for consistency were always executed in the same order. The cases with simple outer-most boundaries (boundaries that can be defined without the use of union operators) are first corrected as follows:

```
python fix_materials.py

python fix_boundary.py
```

The first script adds the nuclear data extension to the materials (for ICSBEP models, it is assumed to be at room temperature) and adds default neutron population parameters. The neutron population parameters are set to simulate 10 k neutrons per cycle with 1 k active cycles and 100 skip cycles (for a total of 10 M active neutron histories). While certain

systems may require more neutron histories to reduce the statistical uncertainty on the estimation of k_{eff}, in practice it was found that these parameters were sufficient to converge to around a 30 pcm uncertainty in k_{eff} or less for most problems.

The second script takes simple (non-union) outer boundaries and adjusts them to use the "outside" Serpent-2 keyword. As a concrete example, the "fix_boundary.py" script will take:

```
cell 5 0 void ( 4 )
```

and change it to:

```
cell 5 0 outside 4
```

More generally, if "N" is the last cell id and "M" is the only thing inside the parentheses, it will change from this:

```
cell N 0 void ( M )
```

to this:

```
cell N 0 outside M
```

However, if the outer-most boundary (as defined in the MCNP input) is a more complex outer boundary (one which uses the union operator), a different script is used to create the "outside" cell, but the script execution is similar:

```
python fix_materials.py

python bounding_surface.py
```

The "bounding_surface.py" does not modify any of the cell definitions but instead creates new surfaces and one new cell that are guaranteed to bound the extents of the original model, and then sets the "root universe" to be the newly added cell. While a spherical bounding surface would be smaller, it is significantly less complicated to find a bounding cube instead. A bounding sphere requires keeping track of the max extent in each of the $\pm x/y/z$ directions and then finding the octant in which the three extents maximise $x_i^2 + y_j^2 + z_k^2$, the square root of which then defines the radius of the bounding sphere. Similarly, a bounding box (rectangular prism) would require keeping track of the maximum of the $+x/y/z$ directions as well as the minimum $-x/y/z$. A bounding cube only requires keeping track of one value, the maximum value of $|x|/|y|/|z|$. Obviously, $V_{sphere} < V_{box} \leq V_{cube}$ but there were not any cases in which this difference mattered for this application space. Using the maximum extent ensures that the problem is never inadvertently clipped (meaning that the bounding cube guarantees the problem volume is entirely within the cube).

One could construct some diabolical configurations where this method will construct a bounding cube that is massive compared to the volume of the actual problem. Consider for example a pin cell where the x/y extents will be a few centimetres but the z extent would be on the order of metres. This would result in a bounding cube that is roughly 10 000 times

the size of the problem volume and will almost certainly cause initial source sampling to fail miserably. Of the cases encountered in this work, it was never an issue.

As another concrete example, here is the output produced by csg2csg for HMF-078, case 41, which used a union operator to define the outer boundary:

```
% --- surface definitions --- %

surf 1 pz 0.0

surf 2 pz 8.1564

surf 3 cylz 0.0 0.0 19.05

% --- cell definitions --- %

cell 1 0 1 ( -2 1 -3 )

cell 99 0 void ( 2: -1: 3 )

% --- material definitions --- %

% M1

mat 1 0.0458309 rgb 0 208 31

92234 1.025073e-02

92235 9.336277e-01

92238 5.612152e-02
```

and here is the patched Serpent-2 input after applying the Python scripts:

```
% --- surface definitions --- %

surf 1 pz 0.0

surf 2 pz 8.1564

surf 3 cylz 0.0 0.0 19.05

surf SHAM cuboid -19.05 19.05 -19.05 19.05 -19.05 19.05

% --- cell definitions --- %

cell 1 0 1 ( -2 1 -3 )

cell 99 0 void ( 2: -1: 3 )

cell MACHI 1 fill 0 -SHAM

cell MACHO 1 outside SHAM
```

```
set root 1

% --- material definitions --- %

% M1

mat 1 0.0458309 rgb 0 208 31

92234.03c 1.025073e-02

92235.03c 9.336277e-01

92238.03c 5.612152e-02

set pop 10000 1000 100
```

In either case, after applying the first two scripts, the Serpent-2 input is now functional. Returning to the original example (with the simple outer boundary), after running the Python scripts to address the issues in point 1, the input will look like this:

```
% --- surface definitions --- %

surf 1 sph 0.0 0.0 0.0 34.4995

surf 2 sph 0.0 0.0 0.0 34.6583

% --- cell definitions --- %

cell 1 0 1 ( -1 )

cell 2 0 2 ( 1 -2 )

cell 3 0 outside  2

% --- material definitions --- %

% M1

mat 1 0.098748 rgb 0 208 31

92234.03c 2.562483e-06

92235.03c 6.238509e-04

92238.03c 1.197797e-02

9019.03c 2.520862e-02

1001.03c 6.246509e-01

8016.03c 3.375361e-01

% M2
```

```
mat 2 0.060317 rgb 0 0 255

13027.03c 9.897504e-01

14028.03c 8.440712e-03

14029.03c 4.273889e-04

14030.03c 2.837057e-04

29063.03c 5.890185e-04

29065.03c 2.625330e-04

25055.03c 2.462443e-04

set pop 10000 1000 100
```

While the Serpent-2 input is now functional, it is still not exactly what was being modelled in the original MCNP input because Serpent-2 has not been told to use the TSL data for ^{1}H-in-H_2O in material 2. While the original MCNP model computes k_{eff} = 0.99569 ± 0.00009 the Serpent-2 model (using the same data except for the missing TSL data for ^{1}H-in-H_2O) gives k_{eff} = 0.97892 ± 0.00021 over 1.67% too low (~$2.5 too low).

To address the missing TSL data (addressing point 2), a final script is run:

```
python fix_tsl.py
```

So that the simple example's final version will be this:

```
% --- surface definitions --- %

surf 1 sph 0.0 0.0 0.0 34.4995

surf 2 sph 0.0 0.0 0.0 34.6583

% --- cell definitions --- %

cell 1 0 1 ( -1 )

cell 2 0 2 ( 1 -2 )

cell 3 0 outside  2

% --- material definitions --- %

% M1

mat 1 0.098748 rgb 0 208 31

moder lwtr 1001 % AMH-THERM

92234.03c 2.562483e-06
```

```
92235.03c 6.238509e-04

92238.03c 1.197797e-02

9019.03c 2.520862e-02

1001.03c 6.246509e-01

8016.03c 3.375361e-01

% M2

mat 2 0.060317 rgb 0 0 255

13027.03c 9.897504e-01

14028.03c 8.440712e-03

14029.03c 4.273889e-04

14030.03c 2.837057e-04

29063.03c 5.890185e-04

29065.03c 2.625330e-04

25055.03c 2.462443e-04

set pop 10000 1000 100

therm lwtr lwe7.00t % AMH-THERM
```

This final version of the Serpent-2 model computes k_{eff} = 0.99587 ± 0.00021, which is statistically equivalent to the original MCNP result.

3. Results

The procedure outlined in the previous chapter was applied to all the ~5 300 original MCNP models. Of the ~5 300 attempts, csg2csg was able to perform at least the initial conversion to produce ~4 500 Serpent-2 input models. The reasons for the initial csg2csg conversion failures were noted in the previous chapter and will not be belaboured further here (missing macrobodies, use of transforms, etc.). Of the ~4 500 initial Serpent-2 models produced by csg2csg, ~2 600 were made functional through application of the Python scripts mentioned in the last chapter. The remaining ~1 900 models are not functional typically because of the use of lattices in the MCNP input, which were not translated correctly by csg2csg; however, while not functional, these inputs are still valuable since they contain almost all the information from the original MCNP input. The non-functional inputs can serve as a starting point for an interested developer to refine into a fully functional model. It is worth mentioning that while human intervention required for these inputs is not ideal, the process would still be fully reproducible using our version control system, git.

Both the MCNP and Serpent-2 models were run using the ENDF-7.1 data. The MCNP results were obtained using MCNP6 and the Serpent-2 results were obtained using Serpent-2.2.0. The complete list of ICSBEP system types covered (with the number of cases) is presented in Table 1, and the results, due to their size, for the NRG, IAEA and UPM models are presented in the Appendix in Tables A.1, A.2, and A.3, respectively.

Table 1. Number of Serpent-2 models for each ICSBEP system covered

ICSBEP System type	Number of cases
HEU-COMP-INTER	13
HEU-MET-FAST	583
HEU-MET-INTER	18
HEU-MET-MIXED	9
HEU-MET-THERM	42
HEU-SOL-THERM	594
IEU-COMP-FAST	4
IEU-COMP-INTER	5
IEU-COMP-THERM	57
IEU-MET-FAST	76
IEU-SOL-THERM	54
LEU-COMP-THERM	11
LEU-SOL-THERM	137
MIX-COMP-FAST	8
MIX-COMP-THERM	33
MIX-MET-FAST	46
MIX-MET-INTER	2
MIX-MISC-FAST	3
MIX-SOL-THERM	32
PU-COMP-INTER	3
PU-COMP-MIXED	69

Table 1. Number of Serpent-2 models for each ICSBEP system covered (Continued)

ICSBEP System type	Number of cases
PU-MET-FAST	130
PU-MET-INTER	7
PU-SOL-THERM	515
SPEC-MET-FAST	1
U233-MET-FAST	30
U233-SOL-INTER	35
U233-SOL-THERM	66

It should first be noted that the suite covers a broad range of different ICSBEP systems, including those with fissile drivers of high-enrichment uranium (HEU), intermediate-enrichment uranium (IEU), low-enrichment uranium (LEU), mixed uranium/plutonium, plutonium only, "special" material (^{237}Np), and ^{233}U. The configurations also cover many different fissile forms such as compound systems, metal systems, solution systems, and the so-called "miscellaneous" systems. The suite also covers a variety of thermal, intermediate, fast and mixed spectra systems.

In general, the Serpent-2 results compare very favourably with the results obtained with the original MCNP inputs. The results should only be expected to be identically the same due to the differences that will occur due to the Monte Carlo nature of the calculations themselves; it is accepted that the results are the same if they fall within three sigma of their combined statistical uncertainty. By that metric, 738 of the NRG results, 673 of the IAEA results, and 91 of the UPM results are identical between the Serpent-2 and MCNP models. The reasons that some of the Serpent-2 models give results that do not compare well with their original MCNP model counterparts are detailed in the next section.

3.1. Known limitations

The two main factors limiting the performance of the subset of poorly performing Serpent-2 are the application of missing TSL data or missing reflective boundary conditions. The latter is simply due to the original MCNP models taking advantage of problem symmetries. The most common recurring symmetry used modelled only one octant of the original problem (for example the $+x/y/z$) and then applied vacuum boundaries on the three external sides and reflective boundaries on the three internal sides. Similarly, others took advantage of half-plane symmetry; for example, modelling only half of the system in z, placing a reflective boundary at the bottom of the model, and applying vacuum boundaries to the remaining boundaries. While these cases could (and should) be fixed by an interested Serpent-2 user, it was outside of the scope of this work. It is worth noting that this type of missing boundary condition is obvious in the result. For example, the Serpent-2 result for LEU-COMP-THERM-008 computed $k_{eff} \cong 0.75$ without the repetition and they now all compute $k_{eff} \cong 1.000$ after adding the correct "usym" option. Similarly, the simplified models used in PU-MET-INTER-003/004 computed $k_{eff} \cong 0.3$ but with the appropriate "usym" option compute $k_{eff} \cong 0.970$.

The released and distributed version of Serpent-2 provides TSL data for ENDF-7.1 only for carbon in graphite, ^{1}H in H_2O (light water), and ^{2}H (D) in D_2O (heavy water). Serpent-2 does have additional TSL data available for other libraries, but the ENDF-7.1 data has been used because it is a widely used library and the Serpent-2 distribution contained isotopic data for carbon (until more recent nuclear data library evaluations, carbon data is usually provided as an elemental evaluation). If one wishes to use one of the

other libraries to have access to other TSL data evaluations, one simply needs to recombine the ^{12}C and ^{13}C in the Serpent-2 model to produce a number density for elemental carbon, which is a straightforward task. It has been decided to work with the isotopic carbon (rather than elemental carbon) because all modern nuclear data libraries favour isotopic rather than elemental evaluations for neutron targets. However, it should be cautioned that the ^{12}C and ^{13}C isotopic neutron data that are present in the Serpent-2 ENDF-7.1 data are taken from the Fusion Evaluated Nuclear Data Library (FENDL)-3.0 and JEFF-3.2, respectively. Depending on the system spectra, this may have a significant impact on the k_{eff}. As an example, the Serpent-2 input created from the UPM MCNP model of HEU-MET-INTER-006, case 2 using isotopic carbon data computes $k_{eff} = 0.99223 \pm 0.00028$ but the same model using elemental carbon data computes $k_{eff} = 0.99697 \pm 0.00029$, a difference of almost 500 pcm (with the elemental result being statistically equivalent to the original MCNP value, $k_{eff} = 0.99623 \pm 0.00033$).

Another thing to note is that the Serpent-2 data (as distributed) does not allow the user to couple ^{12}C and ^{13}C isotopic data with the C-in-graphite TSL data, due to a mismatch in the expected allowed material identifiers. This is also a trivial thing to correct in one's installation (and something that should be fixed in future releases of the Serpent data) but for the purposes of these calculations, no such adjustments were made. By not adjusting the personal installation, transparency and reproducibility are ensured; other users will get the same (statistically equivalent) results from our Serpent-2 inputs without having to make any arcane, cryptic changes. However, this also means that the Serpent-2 inputs do not contain C-in-graphite TSL data, so any systems that are sensitive to the C-in-graphite data should be expected to perform poorly.

Perhaps more importantly, there are other TSL data missing in some of the Serpent-2 models (particularly those for hydrogenous materials, like polyethylene) because they are not present in the ENDF-7.1 data distributed with Serpent-2. However, it should be also pointed out that some of the TSL data missing from the Serpent-2 ENDF-7.1 distribution can be found in some of the other data libraries distributed with Serpent. For example, Serpent-2 also comes with data for JEFF-3.3, which has TSL data for beryllium metal, ^{1}H in calcium hydride, ^{1}H in polyethylene, and others. The Serpent-2 model based on the UPM MCNP model of HEU-MET-FAST-011 computes $k_{eff} = 1.01652 \pm 0.00031$, which is almost 1 800 pcm higher than the MCNP result; if it is decided to use JEFF-3.3 and use the same Serpent model but to add the ^{1}H in polyethylene TSL data and switch to the elemental carbon specification, Serpent-2 computes $k_{eff} = 0.99814 \pm 0.00032$, which is statistically equivalent to the MCNP result.

While the data limitations and boundary conditions present some challenges in limited applicability and utility of some of the Serpent-2 models, it should be reiterated that they are not insurmountable and should be easily remedied in future versions (either with changes in the Serpent distributed data, improvements to the scripts, well-documented human intervention, or some combination thereof). Once the missing TSL data is available, the same scripts can be applied to add them to the Serpent inputs, only requiring that the dictionary mapping be augmented to provide the matching between the isotopic material identifier and the TSL specifier.

It should be also emphasised that the results to be presented here are for verification purposes only, and do not constitute or substitute a validation process. The comparison of the results is presented only to demonstrate the quality of the Serpent-2 model as compared to the original MCNP model and does not constitute any praise or criticism of the original MCNP models, MCNP, Serpent-2, or the ENDF-7.1 data.

4. Conclusions

This report has presented the development and testing of Serpent-2 models covering a wide selection of International Criticality Safety Benchmark Evaluation Project (ICSBEP) benchmarks. The Serpent-2 models were generated using the csg2csg tool, supplemental Python scripts, and original, validated MCNP inputs. The inputs are organised to follow the naming conventions used in ICSBEP Handbook and Database (DICE). As a parting reminder, some important aspects of the Serpent-2 model generation include the transparency, automation and reproducibility of the process. Currently, there are 1 194 functional Serpent-2 inputs in the International Atomic Energy Agency (IAEA) set, 1 277 inputs in the Nuclear Research and Consultancy Group (NRG) set, and 112 inputs in the Universidad Politécnica de Madrid (UPM) set (for a total of 2 583 inputs). There are another 1 888 inputs that are not fully functional but can used as a starting point to generate a working model. The limitations of the models (where applicable) were noted and the specific changes required to improve the results were detailed.

The authors hope that this work serves as an example of how to combine several different resources to provide even more utility to the user community. While this work focused on the development of Serpent-2 models from MCNP models of ICSBEP benchmarks, it is hoped that it is clear how this type of work could be carried out for other code suites (such as MVP, SCALE, OpenMC, etc.) and application areas (those covered by, but not limited to, benchmark repositories such as IRPhE, SFCOMPO 2.0, SINBAD, etc.). It is hoped that this approach is adopted and used by the community for efforts such as nuclear data verification and validation, especially by the ENDF, JEFF, JENDL and CENDL communities. Extending this process to the other aforementioned codes and application areas would also benefit the nuclear data and user communities by improving the testing coverage for a greater variety of practical purposes.

The authors would also like to encourage community engagement and contribution. While this work is already a significant contribution to the community, there are still improvements to be made to the models and significant application areas that are not yet covered (or could have their coverage improved; for instance, the repository has sparse coverage for low-enrichment, composite, thermal [LCT] systems). While the process used to generate the inputs so far is all automated, it should be recognised that this is the ideal but may not be practical in all cases. However, it should be emphasised that these inputs demonstrate a core tenet of science and engineering: reproducibility. Future contributions should be well-documented and take advantage of the git version control system.

While the current study has provided valuable insights, several important concerns remain that warrant future investigation. A key issue is the validity of input models, particularly in cases where discrepancies arise due to outliers when compared with reference benchmark values. This challenge becomes particularly significant when considering the consistency and origin of input data across different contributors (and codes). Future work should consider the consistency of input data sources, compare independent inputs, and attempt to identify any discrepancies (and their root causes).

When input data for the same case is provided by multiple contributors, it is critical to assess whether they all refer to the same original source (ICSBEP benchmark case). Assumptions made in the initial model can lead to significant differences in results, and thus, future studies should establish rigorous procedures for verifying the origin and consistency of inputs across contributors (simplified versus detailed models, model symmetries, compositions, etc.).

In cases where the same benchmark is modelled by different contributors, it is vital to determine whether these inputs produce the same results when using the same code versions and nuclear data. Divergences between independent results could indicate underlying issues in the input data or the modelling approach. Future work should explore methodologies for systematically comparing independent inputs and evaluating their consistency.

When results differ significantly from reference benchmark values, it becomes crucial to identify the source of such discrepancies. A systematic approach should be developed to determine whether the variance is attributable to nuclear data, particularly by comparing cases with similar sensitivity to critical material constituents, or whether the issue lies within an inadequate or incomplete benchmark model. Future research should aim to refine diagnostic techniques that can accurately pinpoint the root cause of these discrepancies.

These concerns, while beyond the current scope of this work, represent essential areas for further study. Addressing these challenges will be vital in improving the robustness and reliability of the Serpent-2 models for use in the nuclear engineering community. The tables presented in the text can also provide some insight into which models may be in the most need of checking. For example, there are Serpent-2 and MCNP results for PU-MET-FAST-009 from three different contributors, and while each Serpent-2 result is statistically the same as its original MCNP source, the NRG model is more detailed than the others and thus gives a different computed k_{eff}.

For those interested in contributing to the repository, it can be found at https://git.oecd-nea.org/serpent/icsbep. As of the writing of this paper, access to the repository is granted to all users who request (and are approved for) the ICSBEP handbook and Serpent-2 from the NEA Data Bank.

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Appendix

Table A.1. Comparison of NRG MCNP results to Serpent-2 results

All calculations use ENDF/B-7.1

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/comp/inter/004/inp.inp	1.01161	0.00024	1.01300	0.00009	-139	-5.42
nrg/heu/met/fast/002/case-1.inp	1.00085	0.00037	1.00145	0.00030	-60	-1.26
nrg/heu/met/fast/003/case-1.inp	0.99483	0.00032	0.99594	0.00027	-111	-2.65
nrg/heu/met/fast/003/case-10.inp	1.00546	0.00038	1.00287	0.00029	259	5.42
nrg/heu/met/fast/003/case-11.inp	1.01005	0.00031	1.00631	0.00030	374	8.67
nrg/heu/met/fast/003/case-12.inp	1.00894	0.00032	1.00944	0.00027	-50	-1.19
nrg/heu/met/fast/003/case-2.inp	0.99448	0.00034	0.99521	0.00030	-73	-1.61
nrg/heu/met/fast/003/case-3.inp	0.99920	0.00034	0.99971	0.00029	-51	-1.14
nrg/heu/met/fast/003/case-4.inp	0.99751	0.00033	0.99829	0.00029	-78	-1.78
nrg/heu/met/fast/003/case-5.inp	1.00201	0.00032	1.00242	0.00030	-41	-0.93
nrg/heu/met/fast/003/case-6.inp	1.00164	0.00030	1.00245	0.00030	-81	-1.91
nrg/heu/met/fast/003/case-7.inp	1.00190	0.00034	1.00195	0.00031	-5	-0.11
nrg/heu/met/fast/003/case-8.inp	1.00151	0.00037	1.00111	0.00028	40	0.86
nrg/heu/met/fast/003/case-9.inp	1.00211	0.00035	1.00122	0.00027	89	2.01
nrg/heu/met/fast/004/inp.inp	1.00334	0.00011	1.00289	0.00035	45	1.23
nrg/heu/met/fast/007/case-1.inp	0.99331	0.00014	0.99335	0.00026	-4	-0.14
nrg/heu/met/fast/008/inp.inp	0.99527	0.00030	0.99593	0.00028	-66	-1.61
nrg/heu/met/fast/009/case-1.inp	0.99841	0.00040	0.99810	0.00028	31	0.63
nrg/heu/met/fast/009/case-2.inp	0.99685	0.00034	0.99639	0.00028	46	1.04
nrg/heu/met/fast/011/inp.inp	0.99891	0.00042	1.01669	0.00031	-1778	-34.06
nrg/heu/met/fast/012/inp.inp	0.99813	0.00030	0.99828	0.00028	-15	-0.37
nrg/heu/met/fast/013/inp.inp	0.99783	0.00032	0.99786	0.00028	-3	-0.07
nrg/heu/met/fast/014/inp.inp	0.99767	0.00034	0.99862	0.00027	-95	-2.19
nrg/heu/met/fast/015/inp.inp	0.99460	0.00032	0.99467	0.00028	-7	-0.16
nrg/heu/met/fast/018/inp.inp	0.99935	0.00036	0.99999	0.00027	-64	-1.42
nrg/heu/met/fast/019/inp.inp	1.00724	0.00039	1.00504	0.00027	220	4.64
nrg/heu/met/fast/020/inp.inp	1.00088	0.00038	0.99975	0.00028	113	2.39
nrg/heu/met/fast/021/inp.inp	0.99728	0.00036	0.99724	0.00027	4	0.09
nrg/heu/met/fast/022/inp.inp	0.99768	0.00010	0.99733	0.00028	35	1.18
nrg/heu/met/fast/027/inp.inp	1.00122	0.00006	1.00089	0.00028	33	1.15
nrg/heu/met/fast/028/inp.inp	1.00285	0.00009	1.00315	0.00030	-30	-0.96
nrg/heu/met/fast/032/case-1.inp	1.00410	0.00035	1.00507	0.00029	-97	-2.13
nrg/heu/met/fast/032/case-2.inp	1.00494	0.00034	1.00619	0.00029	-125	-2.80
nrg/heu/met/fast/032/case-3.inp	0.99997	0.00033	1.00088	0.00028	-91	-2.10
nrg/heu/met/fast/032/case-4.inp	1.00133	0.00033	1.00121	0.00027	12	0.28
nrg/heu/met/fast/034/case-1.inp	0.99826	0.00016	0.99605	0.00029	221	6.67

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/met/fast/034/case-2.inp	0.99892	0.00017	0.99888	0.00031	4	0.11
nrg/heu/met/fast/034/case-3.inp	0.99925	0.00017	0.99674	0.00028	251	7.66
nrg/heu/met/fast/041/case-1.inp	1.00665	0.00033	1.00695	0.00028	-30	-0.69
nrg/heu/met/fast/041/case-2.inp	1.00470	0.00041	1.00595	0.00030	-125	-2.46
nrg/heu/met/fast/041/case-3.inp	1.00269	0.00034	0.99952	0.00027	317	7.30
nrg/heu/met/fast/041/case-4.inp	1.00803	0.00037	1.00343	0.00028	460	9.91
nrg/heu/met/fast/041/case-5.inp	1.00221	0.00033	0.99960	0.00027	261	6.12
nrg/heu/met/fast/041/case-6.inp	1.00457	0.00032	1.00016	0.00027	441	10.53
nrg/heu/met/fast/047/hmf047.s66.inp	1.00256	0.00043	1.00531	0.00029	-275	-5.30
nrg/heu/met/fast/048/case-1.inp	1.00271	0.00043	1.02665	0.00034	-2394	-43.67
nrg/heu/met/fast/048/case-10.inp	0.99723	0.00041	1.05436	0.00033	-5713	-108.55
nrg/heu/met/fast/048/case-11.inp	1.00419	0.00046	1.03250	0.00034	-2831	-49.49
nrg/heu/met/fast/048/case-12.inp	1.00169	0.00042	1.03900	0.00032	-3731	-70.66
nrg/heu/met/fast/048/case-13.inp	1.00480	0.00039	1.05016	0.00030	-4536	-92.19
nrg/heu/met/fast/048/case-14.inp	0.99961	0.00043	1.02815	0.00035	-2854	-51.48
nrg/heu/met/fast/048/case-15.inp	0.99850	0.00039	1.02769	0.00033	-2919	-57.14
nrg/heu/met/fast/048/case-16.inp	0.99376	0.00040	1.02334	0.00034	-2958	-56.35
nrg/heu/met/fast/048/case-17.inp	0.99156	0.00049	1.02549	0.00033	-3393	-57.43
nrg/heu/met/fast/048/case-2.inp	1.00311	0.00046	1.03156	0.00034	-2845	-49.74
nrg/heu/met/fast/048/case-3.inp	1.00123	0.00047	1.05080	0.00032	-4957	-87.18
nrg/heu/met/fast/048/case-4.inp	1.00231	0.00041	1.06288	0.00033	-6057	-115.08
nrg/heu/met/fast/048/case-5.inp	0.99314	0.00040	1.07159	0.00030	-7845	-156.90
nrg/heu/met/fast/048/case-6.inp	1.00123	0.00038	1.02838	0.00035	-2715	-52.55
nrg/heu/met/fast/048/case-7.inp	1.00204	0.00048	1.03126	0.00034	-2922	-49.68
nrg/heu/met/fast/048/case-8.inp	0.99887	0.00046	1.03790	0.00035	-3903	-67.52
nrg/heu/met/fast/048/case-9.inp	0.99720	0.00047	1.04217	0.00034	-4497	-77.52
nrg/heu/met/fast/049/case1.inp	0.99796	0.00028	0.99825	0.00027	-29	-0.75
nrg/heu/met/fast/049/case2.inp	0.99924	0.00031	1.00019	0.00029	-95	-2.24
nrg/heu/met/fast/049/case3.inp	0.99887	0.00037	0.99943	0.00028	-56	-1.21
nrg/heu/met/fast/050/case1.inp	0.99818	0.00031	0.99866	0.00028	-48	-1.15
nrg/heu/met/fast/052/case1.inp	1.00570	0.00038	1.00633	0.00029	-63	-1.32
nrg/heu/met/fast/057/case-1.inp	0.98963	0.00006	0.98956	0.00027	7	0.25
nrg/heu/met/fast/057/case-2.inp	0.99831	0.00006	0.99850	0.00027	-19	-0.69
nrg/heu/met/fast/058/case-1.inp	1.00302	0.00040	1.00505	0.00031	-203	-4.01
nrg/heu/met/fast/058/case-2.inp	1.00549	0.00034	1.00565	0.00028	-16	-0.36
nrg/heu/met/fast/058/case-3.inp	1.00225	0.00037	1.00313	0.00029	-88	-1.87
nrg/heu/met/fast/058/case-4.inp	1.00178	0.00039	1.00210	0.00027	-32	-0.67
nrg/heu/met/fast/058/case-5.inp	1.00072	0.00030	1.00132	0.00028	-60	-1.46
nrg/heu/met/fast/060/inp.inp	1.00334	0.00028	1.00115	0.00020	219	6.36
nrg/heu/met/fast/064/case-1.inp	0.99469	0.00006	0.99457	0.00027	12	0.43
nrg/heu/met/fast/064/case-2.inp	0.99564	0.00007	0.99567	0.00027	-3	-0.11
nrg/heu/met/fast/066/case-1.inp	1.00346	0.00038	1.00400	0.00028	-54	-1.14
nrg/heu/met/fast/066/case-2.inp	1.00142	0.00036	1.00194	0.00028	-52	-1.14

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/met/fast/066/case-3.inp	1.00468	0.00039	1.00483	0.00029	-15	-0.31
nrg/heu/met/fast/066/case-4.inp	1.00495	0.00046	1.00608	0.00029	-113	-2.08
nrg/heu/met/fast/066/case-5.inp	1.00373	0.00032	1.00466	0.00028	-93	-2.19
nrg/heu/met/fast/066/case-6.inp	1.00359	0.00040	1.00316	0.00028	43	0.88
nrg/heu/met/fast/066/case-7.inp	1.00572	0.00036	1.00601	0.00029	-29	-0.63
nrg/heu/met/fast/066/case-8.inp	1.00437	0.00043	1.00472	0.00030	-35	-0.67
nrg/heu/met/fast/066/case-9.inp	1.00212	0.00035	1.00398	0.00029	-186	-4.09
nrg/heu/met/fast/067/case-1.inp	1.00305	0.00036	0.99639	0.00020	666	16.17
nrg/heu/met/fast/067/case-2.inp	0.99659	0.00030	0.99572	0.00020	87	2.41
nrg/heu/met/fast/069/simple_case-1.inp	0.99857	0.00034	0.99841	0.00028	16	0.36
nrg/heu/met/fast/072/case-1.inp	1.00910	0.00021	1.00889	0.00028	21	0.60
nrg/heu/met/fast/073/inp.inp	1.01201	0.00033	1.01163	0.00028	38	0.88
nrg/heu/met/fast/076/case01_dm.inp	0.99752	0.00026	1.00235	0.00027	-483	-12.89
nrg/heu/met/fast/076/case01_sm.inp	0.99769	0.00035	1.00196	0.00028	-427	-9.53
nrg/heu/met/fast/076/case02_dm.inp	0.99750	0.00034	1.00898	0.00028	-1148	-26.06
nrg/heu/met/fast/076/case02_sm.inp	0.99709	0.00033	1.00752	0.00028	-1043	-24.10
nrg/heu/met/fast/076/case03_dm.inp	0.99930	0.00033	1.00962	0.00028	-1032	-23.85
nrg/heu/met/fast/076/case03_sm.inp	0.99927	0.00029	1.01038	0.00028	-1111	-27.56
nrg/heu/met/fast/076/case04_dm.inp	0.99814	0.00037	1.05513	0.00032	-5699	-116.50
nrg/heu/met/fast/076/case04_sm.inp	0.99915	0.00040	1.05499	0.00032	-5584	-109.01
nrg/heu/met/fast/076/case05_dm.inp	1.00048	0.00040	1.05212	0.00033	-5164	-99.58
nrg/heu/met/fast/076/case05_sm.inp	1.00088	0.00047	1.05329	0.00032	-5241	-92.17
nrg/heu/met/fast/076/case06_dm.inp	1.00103	0.00043	1.04663	0.00033	-4560	-84.13
nrg/heu/met/fast/076/case06_sm.inp	1.00080	0.00044	1.04724	0.00032	-4644	-85.36
nrg/heu/met/fast/076/case07_dm.inp	0.99653	0.00036	1.03614	0.00033	-3961	-81.11
nrg/heu/met/fast/076/case07_sm.inp	0.99729	0.00039	1.03707	0.00034	-3978	-76.88
nrg/heu/met/fast/076/case08_dm.inp	0.99892	0.00040	1.03116	0.00035	-3224	-60.66
nrg/heu/met/fast/076/case08_sm.inp	1.00004	0.00046	1.03222	0.00034	-3218	-56.26
nrg/heu/met/fast/076/case09_dm.inp	0.99968	0.00041	1.04637	0.00033	-4669	-88.71
nrg/heu/met/fast/076/case09_sm.inp	1.00064	0.00040	1.04586	0.00031	-4522	-89.36
nrg/heu/met/fast/076/case10_dm.inp	0.99958	0.00035	1.04794	0.00034	-4836	-99.11
nrg/heu/met/fast/076/case10_sm.inp	1.00045	0.00038	1.04847	0.00033	-4802	-95.41
nrg/heu/met/fast/076/case11_dm.inp	0.99826	0.00036	1.03930	0.00033	-4104	-84.04
nrg/heu/met/fast/076/case11_sm.inp	0.99891	0.00042	1.03988	0.00032	-4097	-77.59
nrg/heu/met/fast/076/case12_dm.inp	0.99927	0.00041	1.04432	0.00032	-4505	-86.62
nrg/heu/met/fast/076/case12_sm.inp	1.00004	0.00042	1.04588	0.00033	-4584	-85.82
nrg/heu/met/fast/076/case13_dm.inp	0.99831	0.00038	1.03698	0.00032	-3867	-77.84
nrg/heu/met/fast/076/case13_sm.inp	1.00018	0.00044	1.03894	0.00032	-3876	-71.24
nrg/heu/met/fast/076/case14_dm.inp	0.99896	0.00038	1.04427	0.00033	-4531	-90.03
nrg/heu/met/fast/076/case14_sm.inp	1.00079	0.00039	1.04681	0.00033	-4602	-90.08
nrg/heu/met/fast/076/case15_dm.inp	0.99933	0.00039	1.03982	0.00033	-4049	-79.26
nrg/heu/met/fast/076/case15_sm.inp	1.00035	0.00036	1.04243	0.00032	-4208	-87.36
nrg/heu/met/fast/076/case16_dm.inp	0.99994	0.00042	1.04625	0.00032	-4631	-87.71

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/met/fast/076/case16_sm.inp	1.00079	0.00033	1.04796	0.00033	-4717	-101.07
nrg/heu/met/fast/076/case17_dm.inp	0.99741	0.00038	1.03738	0.00032	-3997	-80.46
nrg/heu/met/fast/076/case17_sm.inp	1.00010	0.00034	1.03970	0.00032	-3960	-84.81
nrg/heu/met/fast/076/case18_dm.inp	0.99886	0.00040	1.04569	0.00032	-4683	-91.42
nrg/heu/met/fast/076/case18_sm.inp	1.00035	0.00039	1.04835	0.00033	-4800	-93.96
nrg/heu/met/fast/076/case19_dm.inp	1.00102	0.00035	1.04036	0.00033	-3934	-81.78
nrg/heu/met/fast/076/case19_sm.inp	1.00209	0.00042	1.04086	0.00033	-3877	-72.58
nrg/heu/met/fast/076/case20_dm.inp	0.99843	0.00037	1.04769	0.00033	-4926	-99.36
nrg/heu/met/fast/076/case20_sm.inp	0.99812	0.00041	1.04895	0.00033	-5083	-96.58
nrg/heu/met/fast/078/case-1.inp	0.99449	0.00037	0.99482	0.00030	-33	-0.69
nrg/heu/met/fast/078/case-11.inp	0.99520	0.00039	1.01722	0.00029	-2202	-45.31
nrg/heu/met/fast/078/case-13.inp	0.99773	0.00031	1.01980	0.00029	-2207	-51.99
nrg/heu/met/fast/078/case-15.inp	0.99606	0.00040	1.01964	0.00029	-2358	-47.73
nrg/heu/met/fast/078/case-17.inp	0.99636	0.00035	1.01890	0.00029	-2254	-49.59
nrg/heu/met/fast/078/case-19.inp	0.99538	0.00039	0.99642	0.00029	-104	-2.14
nrg/heu/met/fast/078/case-21.inp	0.99631	0.00039	0.99796	0.00029	-165	-3.40
nrg/heu/met/fast/078/case-23.inp	0.99883	0.00032	0.99709	0.00027	174	4.16
nrg/heu/met/fast/078/case-25.inp	0.99751	0.00037	0.99560	0.00027	191	4.17
nrg/heu/met/fast/078/case-27.inp	0.99608	0.00034	0.99426	0.00028	182	4.13
nrg/heu/met/fast/078/case-29.inp	1.00209	0.00036	0.99772	0.00028	437	9.58
nrg/heu/met/fast/078/case-3.inp	0.99503	0.00034	0.99611	0.00028	-108	-2.45
nrg/heu/met/fast/078/case-31.inp	0.99539	0.00037	0.99340	0.00028	199	4.29
nrg/heu/met/fast/078/case-33.inp	0.99556	0.00039	0.99138	0.00028	418	8.71
nrg/heu/met/fast/078/case-35.inp	0.99392	0.00034	0.99287	0.00028	105	2.38
nrg/heu/met/fast/078/case-37.inp	0.99679	0.00035	0.99423	0.00027	256	5.79
nrg/heu/met/fast/078/case-39.inp	0.99659	0.00037	0.99506	0.00028	153	3.30
nrg/heu/met/fast/078/case-41.inp	0.99678	0.00030	0.99680	0.00027	-2	-0.05
nrg/heu/met/fast/078/case-43.inp	0.99772	0.00033	0.99693	0.00030	79	1.77
nrg/heu/met/fast/078/case-5.inp	0.99596	0.00038	1.00461	0.00029	-865	-18.10
nrg/heu/met/fast/078/case-7.inp	0.99780	0.00042	1.01502	0.00029	-1722	-33.74
nrg/heu/met/fast/078/case-9.inp	0.99533	0.00040	1.01194	0.00028	-1661	-34.02
nrg/heu/met/fast/079/case-1.inp	0.99937	0.00033	0.99988	0.00026	-51	-1.21
nrg/heu/met/fast/079/case-2.inp	0.99845	0.00034	0.99896	0.00028	-51	-1.16
nrg/heu/met/fast/079/case-3.inp	0.99998	0.00034	1.00028	0.00027	-30	-0.69
nrg/heu/met/fast/079/case-4.inp	1.00095	0.00029	1.00104	0.00028	-9	-0.22
nrg/heu/met/fast/079/case-5.inp	1.00001	0.00033	0.99966	0.00027	35	0.82
nrg/heu/met/fast/080/case-1.inp	1.01056	0.00034	1.01022	0.00028	34	0.77
nrg/heu/met/fast/088/case1.inp	0.99763	0.00040	1.01804	0.00031	-2041	-40.33
nrg/heu/met/fast/088/case2.inp	0.99691	0.00044	1.01234	0.00032	-1543	-28.36
nrg/heu/met/fast/090/case1.inp	1.00603	0.00040	1.03754	0.00030	-3151	-63.02
nrg/heu/met/fast/090/case2.inp	1.00119	0.00044	1.03240	0.00030	-3121	-58.61
nrg/heu/met/inter/006/case-1.inp	0.99310	0.00022	0.98903	0.00029	407	11.18
nrg/heu/met/inter/006/case-2.inp	0.99664	0.00025	0.99327	0.00028	337	8.98

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/met/inter/006/case-3.inp	1.00080	0.00024	0.99706	0.00027	374	10.35
nrg/heu/met/inter/006/case-4.inp	1.00749	0.00027	1.00507	0.00028	242	6.22
nrg/heu/met/mixed/017/case1.inp	0.99580	0.00042	1.02554	0.00032	-2974	-56.32
nrg/heu/met/therm/001/detail.inp	1.00667	0.00044	1.03026	0.00032	-2359	-43.36
nrg/heu/met/therm/001/simple.inp	1.00650	0.00042	1.02851	0.00031	-2201	-42.16
nrg/heu/met/therm/003/case-1.inp	1.00627	0.00040	1.00620	0.00036	7	0.13
nrg/heu/met/therm/003/case-2.inp	0.98667	0.00043	0.98704	0.00036	-37	-0.66
nrg/heu/met/therm/003/case-3.inp	0.97912	0.00049	0.97955	0.00034	-43	-0.72
nrg/heu/met/therm/003/case-4.inp	0.98593	0.00043	0.98654	0.00035	-61	-1.10
nrg/heu/met/therm/003/case-6.inp	0.97026	0.00049	0.96965	0.00035	61	1.01
nrg/heu/met/therm/003/case-7.inp	0.98556	0.00043	0.98506	0.00034	50	0.91
nrg/heu/met/therm/008/detail.inp	1.00721	0.00049	1.03149	0.00032	-2428	-41.49
nrg/heu/met/therm/008/simple.inp	1.01776	0.00049	1.04165	0.00031	-2389	-41.20
nrg/heu/met/therm/009/detail.inp	1.01116	0.00048	1.03471	0.00032	-2355	-40.82
nrg/heu/met/therm/009/simple.inp	1.00269	0.00044	1.02545	0.00031	-2276	-42.29
nrg/heu/met/therm/010/15mil.inp	1.00880	0.00051	1.03473	0.00030	-2593	-43.82
nrg/heu/met/therm/010/7.5mil.inp	1.00884	0.00046	1.03357	0.00031	-2473	-44.58
nrg/heu/met/therm/013/15mil.inp	1.00744	0.00043	1.03499	0.00030	-2755	-52.55
nrg/heu/met/therm/013/625in.inp	1.00783	0.00042	1.03054	0.00031	-2271	-43.50
nrg/heu/met/therm/014/simple.inp	1.00665	0.00044	1.04302	0.00031	-3637	-67.57
nrg/heu/met/therm/016/detail.inp	1.00087	0.00047	1.01695	0.00032	-1608	-28.28
nrg/heu/met/therm/016/simple.inp	1.01228	0.00039	1.02895	0.00031	-1667	-33.46
nrg/heu/met/therm/018/detail.inp	1.00023	0.00041	1.02251	0.00031	-2228	-43.35
nrg/heu/met/therm/018/simple.inp	1.00161	0.00045	1.02341	0.00031	-2180	-39.89
nrg/heu/met/therm/022/inp.inp	0.99869	0.00045	0.99831	0.00030	38	0.70
nrg/heu/met/therm/033/detail_33.inp	1.00422	0.00046	1.02880	0.00031	-2458	-44.31
nrg/heu/met/therm/033/simple_33.inp	1.00279	0.00048	1.02837	0.00032	-2558	-44.34
nrg/heu/sol/therm/001/case-1.inp	0.99849	0.00056	0.99802	0.00036	47	0.71
nrg/heu/sol/therm/001/case-10.inp	0.99264	0.00049	0.99178	0.00032	86	1.47
nrg/heu/sol/therm/001/case-2.inp	0.99499	0.00061	0.99562	0.00037	-63	-0.88
nrg/heu/sol/therm/001/case-3.inp	1.00096	0.00058	1.00109	0.00035	-13	-0.19
nrg/heu/sol/therm/001/case-4.inp	0.99818	0.00062	0.99805	0.00038	13	0.18
nrg/heu/sol/therm/001/case-5.inp	0.99861	0.00049	0.99788	0.00030	73	1.27
nrg/heu/sol/therm/001/case-6.inp	1.00179	0.00048	1.00169	0.00032	10	0.17
nrg/heu/sol/therm/001/case-7.inp	0.99793	0.00054	0.99726	0.00035	67	1.04
nrg/heu/sol/therm/001/case-8.inp	0.99880	0.00070	0.99802	0.00034	78	1.00
nrg/heu/sol/therm/001/case-9.inp	0.99403	0.00053	0.99402	0.00038	1	0.02
nrg/heu/sol/therm/002/case-1.inp	1.00204	0.00050	1.00261	0.00040	-57	-0.89
nrg/heu/sol/therm/002/case-10.inp	1.00594	0.00051	1.00641	0.00034	-47	-0.77
nrg/heu/sol/therm/002/case-11.inp	1.00385	0.00049	1.00359	0.00041	26	0.41
nrg/heu/sol/therm/002/case-12.inp	1.00926	0.00053	1.00942	0.00036	-16	-0.25
nrg/heu/sol/therm/002/case-13.inp	0.99911	0.00059	0.99955	0.00042	-44	-0.61
nrg/heu/sol/therm/002/case-14.inp	1.00876	0.00060	1.00867	0.00040	9	0.12

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/sol/therm/002/case-2.inp	1.00734	0.00066	1.00797	0.00037	-63	-0.83
nrg/heu/sol/therm/002/case-3.inp	0.99984	0.00050	0.99902	0.00040	82	1.28
nrg/heu/sol/therm/002/case-4.inp	1.00381	0.00051	1.00434	0.00042	-53	-0.80
nrg/heu/sol/therm/002/case-5.inp	1.00492	0.00058	1.00587	0.00042	-95	-1.33
nrg/heu/sol/therm/002/case-6.inp	1.00938	0.00062	1.00987	0.00037	-49	-0.68
nrg/heu/sol/therm/002/case-7.inp	1.00133	0.00059	1.00082	0.00041	51	0.71
nrg/heu/sol/therm/002/case-8.inp	1.00654	0.00061	1.00646	0.00040	8	0.11
nrg/heu/sol/therm/002/case-9.inp	1.00104	0.00048	1.00104	0.00035	0	0.00
nrg/heu/sol/therm/003/case-1.inp	1.00174	0.00050	1.00128	0.00035	46	0.75
nrg/heu/sol/therm/003/case-10.inp	0.99665	0.00059	0.99668	0.00043	-3	-0.04
nrg/heu/sol/therm/003/case-11.inp	1.00301	0.00052	1.00360	0.00039	-59	-0.91
nrg/heu/sol/therm/003/case-12.inp	1.00106	0.00047	1.00042	0.00037	64	1.07
nrg/heu/sol/therm/003/case-13.inp	1.00075	0.00051	1.00014	0.00034	61	1.00
nrg/heu/sol/therm/003/case-14.inp	1.00201	0.00050	1.00094	0.00036	107	1.74
nrg/heu/sol/therm/003/case-15.inp	0.99333	0.00049	0.99337	0.00035	-4	-0.07
nrg/heu/sol/therm/003/case-16.inp	0.99893	0.00053	0.99896	0.00035	-3	-0.05
nrg/heu/sol/therm/003/case-17.inp	1.00569	0.00049	1.00504	0.00040	65	1.03
nrg/heu/sol/therm/003/case-18.inp	0.99522	0.00055	0.99539	0.00041	-17	-0.25
nrg/heu/sol/therm/003/case-19.inp	1.00702	0.00051	1.00781	0.00041	-79	-1.21
nrg/heu/sol/therm/003/case-2.inp	1.00239	0.00050	1.00184	0.00036	55	0.89
nrg/heu/sol/therm/003/case-3.inp	0.99781	0.00061	0.99919	0.00041	-138	-1.88
nrg/heu/sol/therm/003/case-4.inp	1.00210	0.00054	1.00178	0.00040	32	0.48
nrg/heu/sol/therm/003/case-5.inp	0.99736	0.00056	0.99634	0.00042	102	1.46
nrg/heu/sol/therm/003/case-6.inp	0.99928	0.00062	1.00018	0.00041	-90	-1.21
nrg/heu/sol/therm/003/case-7.inp	1.00188	0.00044	1.00088	0.00035	100	1.78
nrg/heu/sol/therm/003/case-8.inp	1.00122	0.00064	1.00152	0.00041	-30	-0.39
nrg/heu/sol/therm/003/case-9.inp	1.00453	0.00056	1.00410	0.00039	43	0.63
nrg/heu/sol/therm/004/case-1.inp	0.98548	0.00017	0.98602	0.00031	-54	-1.53
nrg/heu/sol/therm/004/case-2.inp	0.98089	0.00019	0.98174	0.00030	-85	-2.39
nrg/heu/sol/therm/004/case-3.inp	0.98809	0.00019	0.98859	0.00032	-50	-1.34
nrg/heu/sol/therm/004/case-4.inp	0.99055	0.00021	0.99152	0.00034	-97	-2.43
nrg/heu/sol/therm/004/case-5.inp	0.98872	0.00020	0.98940	0.00034	-68	-1.72
nrg/heu/sol/therm/004/case-6.inp	0.98541	0.00020	0.98560	0.00036	-19	-0.46
nrg/heu/sol/therm/009/case-1.inp	1.00219	0.00025	1.00223	0.00037	-4	-0.09
nrg/heu/sol/therm/009/case-2.inp	1.00243	0.00024	1.00209	0.00039	34	0.74
nrg/heu/sol/therm/009/case-3.inp	1.00182	0.00024	1.00275	0.00039	-93	-2.03
nrg/heu/sol/therm/009/case-4.inp	0.99617	0.00024	0.99563	0.00040	54	1.16
nrg/heu/sol/therm/010/case-1.inp	1.00107	0.00022	1.00115	0.00037	-8	-0.19
nrg/heu/sol/therm/010/case-2.inp	1.00184	0.00023	1.00111	0.00036	73	1.71
nrg/heu/sol/therm/010/case-3.inp	0.99868	0.00023	0.99907	0.00037	-39	-0.90
nrg/heu/sol/therm/010/case-4.inp	0.99737	0.00023	0.99762	0.00039	-25	-0.55
nrg/heu/sol/therm/011/case-1.inp	1.00523	0.00042	1.00408	0.00031	115	2.20
nrg/heu/sol/therm/011/case-2.inp	1.00074	0.00037	1.00116	0.00033	-42	-0.85

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/sol/therm/013/case-1.inp	0.99889	0.00011	0.99907	0.00018	-18	-0.85
nrg/heu/sol/therm/013/case-2.inp	0.99775	0.00012	0.99749	0.00018	26	1.20
nrg/heu/sol/therm/013/case-3.inp	0.99427	0.00014	0.99426	0.00017	1	0.05
nrg/heu/sol/therm/013/case-4.inp	0.99574	0.00013	0.99591	0.00017	-17	-0.79
nrg/heu/sol/therm/014/case-1.inp	0.99420	0.00048	0.99447	0.00033	-27	-0.46
nrg/heu/sol/therm/014/case-2.inp	1.01028	0.00046	1.00997	0.00028	31	0.58
nrg/heu/sol/therm/014/case-3.inp	1.02074	0.00042	1.01956	0.00025	118	2.41
nrg/heu/sol/therm/015/case-1.inp	0.99724	0.00050	0.99794	0.00034	-70	-1.16
nrg/heu/sol/therm/015/case-2.inp	0.98895	0.00052	0.99013	0.00035	-118	-1.88
nrg/heu/sol/therm/015/case-3.inp	1.00816	0.00044	1.00796	0.00029	20	0.38
nrg/heu/sol/therm/015/case-4.inp	1.01309	0.00047	1.01298	0.00029	11	0.20
nrg/heu/sol/therm/015/case-5.inp	1.01074	0.00042	1.00913	0.00023	161	3.36
nrg/heu/sol/therm/016/case-1.inp	0.98959	0.00052	0.98977	0.00038	-18	-0.28
nrg/heu/sol/therm/016/case-2.inp	1.00723	0.00050	1.00623	0.00030	100	1.71
nrg/heu/sol/therm/016/case-3.inp	1.02508	0.00050	1.02441	0.00026	67	1.19
nrg/heu/sol/therm/017/case-1.inp	0.99047	0.00047	0.99066	0.00037	-19	-0.32
nrg/heu/sol/therm/017/case-2.inp	0.98061	0.00053	0.98091	0.00038	-30	-0.46
nrg/heu/sol/therm/017/case-3.inp	0.97882	0.00053	0.97996	0.00038	-114	-1.75
nrg/heu/sol/therm/017/case-4.inp	0.99716	0.00053	0.99517	0.00033	199	3.19
nrg/heu/sol/therm/017/case-5.inp	1.00571	0.00047	1.00511	0.00030	60	1.08
nrg/heu/sol/therm/017/case-6.inp	1.00174	0.00047	1.00101	0.00029	73	1.32
nrg/heu/sol/therm/017/case-7.inp	1.00413	0.00048	1.00456	0.00030	-43	-0.76
nrg/heu/sol/therm/017/case-8.inp	1.00060	0.00049	0.99981	0.00026	79	1.42
nrg/heu/sol/therm/018/case-1.inp	0.98821	0.00050	0.98913	0.00039	-92	-1.45
nrg/heu/sol/therm/018/case-10.inp	1.01941	0.00046	1.01885	0.00025	56	1.07
nrg/heu/sol/therm/018/case-11.inp	1.02067	0.00051	1.02071	0.00027	-4	-0.07
nrg/heu/sol/therm/018/case-12.inp	1.01441	0.00049	1.01339	0.00023	102	1.88
nrg/heu/sol/therm/018/case-2.inp	0.98435	0.00052	0.98760	0.00037	-325	-5.09
nrg/heu/sol/therm/018/case-3.inp	0.98864	0.00053	0.98884	0.00038	-20	-0.31
nrg/heu/sol/therm/018/case-4.inp	0.99725	0.00045	0.99677	0.00034	48	0.85
nrg/heu/sol/therm/018/case-5.inp	0.99057	0.00046	0.99101	0.00034	-44	-0.77
nrg/heu/sol/therm/018/case-6.inp	0.99106	0.00049	0.99040	0.00033	66	1.12
nrg/heu/sol/therm/018/case-7.inp	1.00586	0.00048	1.00513	0.00029	73	1.30
nrg/heu/sol/therm/018/case-8.inp	1.00760	0.00050	1.00668	0.00028	92	1.61
nrg/heu/sol/therm/018/case-9.inp	1.00329	0.00051	1.00340	0.00029	-11	-0.19
nrg/heu/sol/therm/019/case-1.inp	0.99700	0.00052	0.99730	0.00039	-30	-0.46
nrg/heu/sol/therm/019/case-2.inp	0.99979	0.00059	0.99864	0.00034	115	1.69
nrg/heu/sol/therm/019/case-3.inp	0.99416	0.00051	0.99397	0.00031	19	0.32
nrg/heu/sol/therm/020/case-1.inp	0.99063	0.00059	0.99185	0.00037	-122	-1.75
nrg/heu/sol/therm/020/case-2.inp	0.99712	0.00064	0.99633	0.00037	79	1.07
nrg/heu/sol/therm/020/case-3.inp	1.00412	0.00057	1.00498	0.00038	-86	-1.26
nrg/heu/sol/therm/020/case-4.inp	1.00422	0.00063	1.00417	0.00039	5	0.07
nrg/heu/sol/therm/020/case-5.inp	1.01179	0.00054	1.01304	0.00037	-125	-1.91

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/sol/therm/022/case-1.inp	0.99620	0.00048	0.99542	0.00036	78	1.30
nrg/heu/sol/therm/023/case-1.inp	0.99334	0.00045	0.99200	0.00039	134	2.25
nrg/heu/sol/therm/024/case-1.inp	0.98920	0.00058	0.99000	0.00038	-80	-1.15
nrg/heu/sol/therm/024/case-10.inp	0.99338	0.00046	0.99175	0.00036	163	2.79
nrg/heu/sol/therm/024/case-11.inp	0.99741	0.00044	0.99730	0.00033	11	0.20
nrg/heu/sol/therm/024/case-2.inp	0.97799	0.00060	0.97936	0.00038	-137	-1.93
nrg/heu/sol/therm/024/case-3.inp	0.98984	0.00050	0.99001	0.00037	-17	-0.27
nrg/heu/sol/therm/024/case-4.inp	0.99121	0.00054	0.99111	0.00035	10	0.16
nrg/heu/sol/therm/024/case-7.inp	0.98415	0.00056	0.98463	0.00033	-48	-0.74
nrg/heu/sol/therm/024/case-8.inp	0.99221	0.00042	0.99220	0.00033	1	0.02
nrg/heu/sol/therm/024/case-9.inp	0.99076	0.00049	0.99205	0.00035	-129	-2.14
nrg/heu/sol/therm/025/case-1.inp	1.00063	0.00018	1.00083	0.00032	-20	-0.54
nrg/heu/sol/therm/025/case-10.inp	1.00865	0.00016	1.00792	0.00025	73	2.46
nrg/heu/sol/therm/025/case-11.inp	1.00816	0.00015	1.00695	0.00024	121	4.28
nrg/heu/sol/therm/025/case-12.inp	1.00643	0.00017	1.00549	0.00024	94	3.20
nrg/heu/sol/therm/025/case-13.inp	1.01454	0.00015	1.01338	0.00023	116	4.22
nrg/heu/sol/therm/025/case-14.inp	1.00527	0.00016	1.00415	0.00026	112	3.67
nrg/heu/sol/therm/025/case-15.inp	0.99968	0.00016	0.99848	0.00027	120	3.82
nrg/heu/sol/therm/025/case-16.inp	1.00921	0.00017	1.00842	0.00026	79	2.54
nrg/heu/sol/therm/025/case-17.inp	1.00125	0.00017	1.00029	0.00026	96	3.09
nrg/heu/sol/therm/025/case-18.inp	0.99903	0.00016	0.99911	0.00028	-8	-0.25
nrg/heu/sol/therm/025/case-2.inp	1.00030	0.00018	1.00052	0.00031	-22	-0.61
nrg/heu/sol/therm/025/case-3.inp	0.99556	0.00016	0.99521	0.00025	35	1.18
nrg/heu/sol/therm/025/case-4.inp	1.00055	0.00017	1.00112	0.00032	-57	-1.57
nrg/heu/sol/therm/025/case-5.inp	1.00287	0.00019	1.00299	0.00034	-12	-0.31
nrg/heu/sol/therm/025/case-6.inp	1.00888	0.00017	1.00817	0.00025	71	2.35
nrg/heu/sol/therm/025/case-7.inp	1.01295	0.00016	1.01233	0.00024	62	2.15
nrg/heu/sol/therm/025/case-8.inp	1.01027	0.00015	1.00992	0.00023	35	1.27
nrg/heu/sol/therm/025/case-9.inp	1.00419	0.00016	1.00353	0.00025	66	2.22
nrg/heu/sol/therm/027/case-1.inp	0.99607	0.00059	0.99628	0.00034	-21	-0.31
nrg/heu/sol/therm/027/case-2.inp	0.99656	0.00048	0.99641	0.00036	15	0.25
nrg/heu/sol/therm/027/case-3.inp	0.99789	0.00057	0.99714	0.00035	75	1.12
nrg/heu/sol/therm/027/case-4.inp	0.99813	0.00053	0.99799	0.00035	14	0.22
nrg/heu/sol/therm/027/case-5.inp	0.99727	0.00051	0.99618	0.00036	109	1.75
nrg/heu/sol/therm/027/case-6.inp	0.99067	0.00048	0.99070	0.00034	-3	-0.05
nrg/heu/sol/therm/027/case-7.inp	0.99604	0.00053	0.99649	0.00034	-45	-0.71
nrg/heu/sol/therm/027/case-8.inp	1.00003	0.00060	0.99957	0.00035	46	0.66
nrg/heu/sol/therm/027/case-9.inp	0.99668	0.00053	0.99668	0.00035	0	0.00
nrg/heu/sol/therm/028/case-1.inp	0.99710	0.00050	0.99654	0.00035	56	0.92
nrg/heu/sol/therm/028/case-10.inp	0.99384	0.00046	0.99341	0.00039	43	0.71
nrg/heu/sol/therm/028/case-11.inp	0.99736	0.00051	0.99661	0.00039	75	1.17
nrg/heu/sol/therm/028/case-12.inp	0.99451	0.00054	0.99445	0.00039	6	0.09
nrg/heu/sol/therm/028/case-13.inp	0.99637	0.00054	0.99536	0.00040	101	1.50

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/sol/therm/028/case-14.inp	0.99603	0.00054	0.99611	0.00038	-8	-0.12
nrg/heu/sol/therm/028/case-15.inp	1.00417	0.00053	1.00496	0.00040	-79	-1.19
nrg/heu/sol/therm/028/case-16.inp	0.99908	0.00048	1.00062	0.00039	-154	-2.49
nrg/heu/sol/therm/028/case-17.inp	0.99551	0.00049	0.99606	0.00039	-55	-0.88
nrg/heu/sol/therm/028/case-18.inp	0.99648	0.00047	0.99650	0.00040	-2	-0.03
nrg/heu/sol/therm/028/case-2.inp	0.99683	0.00049	0.99705	0.00032	-22	-0.38
nrg/heu/sol/therm/028/case-3.inp	0.99752	0.00047	0.99857	0.00035	-105	-1.79
nrg/heu/sol/therm/028/case-4.inp	0.99930	0.00041	0.99923	0.00033	7	0.13
nrg/heu/sol/therm/028/case-5.inp	0.99345	0.00046	0.99376	0.00036	-31	-0.53
nrg/heu/sol/therm/028/case-6.inp	0.99736	0.00050	0.99750	0.00035	-14	-0.23
nrg/heu/sol/therm/028/case-7.inp	0.99802	0.00054	0.99831	0.00034	-29	-0.45
nrg/heu/sol/therm/028/case-8.inp	0.99784	0.00047	0.99745	0.00036	39	0.66
nrg/heu/sol/therm/028/case-9.inp	0.99522	0.00051	0.99550	0.00040	-28	-0.43
nrg/heu/sol/therm/029/case-1.inp	0.99858	0.00049	0.99805	0.00037	53	0.86
nrg/heu/sol/therm/029/case-2.inp	1.00300	0.00060	1.00172	0.00038	128	1.80
nrg/heu/sol/therm/029/case-3.inp	0.99401	0.00058	0.99364	0.00037	37	0.54
nrg/heu/sol/therm/029/case-4.inp	0.99286	0.00058	0.99259	0.00036	27	0.40
nrg/heu/sol/therm/029/case-5.inp	0.99728	0.00048	0.99824	0.00038	-96	-1.57
nrg/heu/sol/therm/029/case-6.inp	0.99792	0.00053	0.99816	0.00038	-24	-0.37
nrg/heu/sol/therm/029/case-7.inp	0.99889	0.00050	0.99897	0.00039	-8	-0.13
nrg/heu/sol/therm/030/case-1.inp	0.99609	0.00049	0.99700	0.00035	-91	-1.51
nrg/heu/sol/therm/030/case-2.inp	0.99835	0.00046	0.99754	0.00035	81	1.40
nrg/heu/sol/therm/030/case-3.inp	0.99531	0.00041	0.99639	0.00032	-108	-2.08
nrg/heu/sol/therm/030/case-4.inp	1.00078	0.00053	1.00025	0.00036	53	0.83
nrg/heu/sol/therm/030/case-5.inp	0.99568	0.00055	0.99592	0.00038	-24	-0.36
nrg/heu/sol/therm/030/case-6.inp	0.99858	0.00059	0.99812	0.00038	46	0.66
nrg/heu/sol/therm/030/case-7.inp	0.99701	0.00054	0.99714	0.00037	-13	-0.20
nrg/heu/sol/therm/032/case-1.inp	0.99949	0.00008	0.99147	0.00012	802	55.61
nrg/heu/sol/therm/033/case-02a.inp	0.99800	0.00058	0.99790	0.00036	10	0.15
nrg/heu/sol/therm/033/case-02b.inp	0.99560	0.00054	0.99537	0.00037	23	0.35
nrg/heu/sol/therm/033/case-02c.inp	0.99404	0.00059	0.99597	0.00035	-193	-2.81
nrg/heu/sol/therm/033/case-03a.inp	1.00230	0.00057	1.00524	0.00036	-294	-4.36
nrg/heu/sol/therm/033/case-03b.inp	1.00319	0.00056	1.00404	0.00037	-85	-1.27
nrg/heu/sol/therm/033/case-03c.inp	1.00834	0.00055	1.00956	0.00035	-122	-1.87
nrg/heu/sol/therm/033/case-04a.inp	1.00504	0.00057	1.00544	0.00035	-40	-0.60
nrg/heu/sol/therm/033/case-04b.inp	1.00587	0.00050	1.00627	0.00037	-40	-0.64
nrg/heu/sol/therm/033/case-05a.inp	1.00832	0.00049	1.00904	0.00037	-72	-1.17
nrg/heu/sol/therm/033/case-05b.inp	1.00440	0.00044	1.00499	0.00036	-59	-1.04
nrg/heu/sol/therm/033/case-06a.inp	1.00515	0.00060	1.00657	0.00037	-142	-2.01
nrg/heu/sol/therm/033/case-06b.inp	1.00623	0.00060	1.00644	0.00036	-21	-0.30
nrg/heu/sol/therm/033/case-07a.inp	0.99984	0.00045	1.00084	0.00036	-100	-1.74
nrg/heu/sol/therm/033/case-07b.inp	1.00243	0.00051	1.00234	0.00036	9	0.14
nrg/heu/sol/therm/033/case-08a.inp	1.00248	0.00054	1.00327	0.00036	-79	-1.22

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/sol/therm/033/case-08b.inp	1.00182	0.00057	1.00248	0.00035	-66	-0.99
nrg/heu/sol/therm/033/case-09a.inp	0.99882	0.00058	0.99974	0.00034	-92	-1.37
nrg/heu/sol/therm/033/case-09b.inp	0.99354	0.00049	0.99447	0.00036	-93	-1.53
nrg/heu/sol/therm/033/case-09c.inp	0.99268	0.00055	0.99284	0.00036	-16	-0.24
nrg/heu/sol/therm/033/case-10a.inp	1.00214	0.00066	1.00183	0.00035	31	0.41
nrg/heu/sol/therm/033/case-10c.inp	0.99954	0.00055	1.00068	0.00035	-114	-1.75
nrg/heu/sol/therm/033/case-10d.inp	0.99177	0.00054	0.99269	0.00037	-92	-1.41
nrg/heu/sol/therm/033/case-11a.inp	1.00357	0.00062	1.00416	0.00037	-59	-0.82
nrg/heu/sol/therm/033/case-11b.inp	0.99846	0.00057	0.99952	0.00034	-106	-1.60
nrg/heu/sol/therm/033/case-12a.inp	1.00184	0.00058	1.00212	0.00038	-28	-0.40
nrg/heu/sol/therm/033/case-12b.inp	0.99888	0.00060	0.99887	0.00035	1	0.01
nrg/heu/sol/therm/034/detail_case-1.inp	1.00007	0.00045	0.99861	0.00038	146	2.48
nrg/heu/sol/therm/036/case-1.inp	0.99256	0.00050	0.99299	0.00033	-43	-0.72
nrg/heu/sol/therm/037/case-1.inp	1.00817	0.00034	1.00897	0.00027	-80	-1.84
nrg/heu/sol/therm/038/case-1.inp	0.99534	0.00036	0.99504	0.00035	30	0.60
nrg/heu/sol/therm/038/case-10.inp	0.99730	0.00044	0.99677	0.00035	53	0.94
nrg/heu/sol/therm/038/case-11.inp	0.99601	0.00038	0.99736	0.00034	-135	-2.65
nrg/heu/sol/therm/038/case-12.inp	0.99594	0.00042	0.99605	0.00036	-11	-0.20
nrg/heu/sol/therm/038/case-13.inp	1.00114	0.00045	1.00051	0.00035	63	1.11
nrg/heu/sol/therm/038/case-14.inp	1.00152	0.00046	1.00124	0.00034	28	0.49
nrg/heu/sol/therm/038/case-15.inp	1.00142	0.00046	1.00173	0.00035	-31	-0.54
nrg/heu/sol/therm/038/case-16.inp	1.00095	0.00049	1.00018	0.00036	77	1.27
nrg/heu/sol/therm/038/case-17.inp	0.99723	0.00043	0.99525	0.00036	198	3.53
nrg/heu/sol/therm/038/case-18.inp	0.99766	0.00042	0.99560	0.00036	206	3.72
nrg/heu/sol/therm/038/case-19.inp	0.99725	0.00046	0.99648	0.00034	77	1.35
nrg/heu/sol/therm/038/case-2.inp	0.99691	0.00047	1.00339	0.00034	-648	-11.17
nrg/heu/sol/therm/038/case-20.inp	0.99703	0.00044	0.99671	0.00036	32	0.56
nrg/heu/sol/therm/038/case-21.inp	0.99651	0.00048	0.99690	0.00035	-39	-0.66
nrg/heu/sol/therm/038/case-22.inp	0.99844	0.00038	0.99854	0.00036	-10	-0.19
nrg/heu/sol/therm/038/case-23.inp	0.99853	0.00045	0.99900	0.00034	-47	-0.83
nrg/heu/sol/therm/038/case-24.inp	0.99687	0.00045	0.99755	0.00036	-68	-1.18
nrg/heu/sol/therm/038/case-25.inp	0.99796	0.00042	0.99604	0.00034	192	3.55
nrg/heu/sol/therm/038/case-26.inp	0.99714	0.00044	0.99726	0.00036	-12	-0.21
nrg/heu/sol/therm/038/case-27.inp	0.99767	0.00043	0.99693	0.00037	74	1.30
nrg/heu/sol/therm/038/case-28.inp	0.99374	0.00042	0.99438	0.00036	-64	-1.16
nrg/heu/sol/therm/038/case-29.inp	1.04030	0.00047	1.04154	0.00034	-124	-2.14
nrg/heu/sol/therm/038/case-3.inp	0.99829	0.00040	0.99659	0.00036	170	3.16
nrg/heu/sol/therm/038/case-30.inp	1.00771	0.00050	1.00928	0.00035	-157	-2.57
nrg/heu/sol/therm/038/case-4.inp	0.99553	0.00045	0.99539	0.00036	14	0.24
nrg/heu/sol/therm/038/case-5.inp	0.99531	0.00016	0.99596	0.00036	-65	-1.65
nrg/heu/sol/therm/038/case-6.inp	0.99603	0.00040	1.00304	0.00035	-701	-13.19
nrg/heu/sol/therm/038/case-7.inp	0.99869	0.00045	0.99644	0.00035	225	3.95
nrg/heu/sol/therm/038/case-8.inp	0.99865	0.00040	0.99634	0.00036	231	4.29

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/sol/therm/038/case-9.inp	0.99613	0.00045	0.99605	0.00036	8	0.14
nrg/heu/sol/therm/039/case-1.inp	1.05837	0.00047	1.03672	0.00036	2165	36.57
nrg/heu/sol/therm/039/case-2.inp	1.05195	0.00043	1.02869	0.00037	2326	41.00
nrg/heu/sol/therm/039/case-3.inp	1.04751	0.00046	1.02640	0.00038	2111	35.38
nrg/heu/sol/therm/039/case-4.inp	1.05000	0.00042	1.03107	0.00037	1893	33.82
nrg/heu/sol/therm/039/case-5.inp	1.06010	0.00043	1.04373	0.00038	1637	28.53
nrg/heu/sol/therm/039/case-6.inp	1.04020	0.00049	1.02803	0.00038	1217	19.63
nrg/heu/sol/therm/042/case-1.inp	0.99712	0.00024	0.99640	0.00014	72	2.59
nrg/heu/sol/therm/042/case-2.inp	0.99579	0.00022	0.99687	0.00015	-108	-4.06
nrg/heu/sol/therm/042/case-3.inp	1.00089	0.00018	1.00085	0.00012	4	0.18
nrg/heu/sol/therm/042/case-4.inp	1.00168	0.00018	1.00195	0.00010	-27	-1.31
nrg/heu/sol/therm/042/case-5.inp	1.00015	0.00015	1.00038	0.00008	-23	-1.35
nrg/heu/sol/therm/042/case-6.inp	1.00065	0.00015	1.00055	0.00009	10	0.57
nrg/heu/sol/therm/042/case-7.inp	1.00161	0.00013	1.00118	0.00007	43	2.91
nrg/heu/sol/therm/042/case-8.inp	1.00173	0.00012	1.00208	0.00006	-35	-2.61
nrg/heu/sol/therm/049/case-1.inp	0.99880	0.00059	0.99842	0.00040	38	0.53
nrg/heu/sol/therm/049/case-10.inp	0.99033	0.00062	0.98872	0.00040	161	2.18
nrg/heu/sol/therm/049/case-11.inp	0.99370	0.00058	0.99264	0.00037	106	1.54
nrg/heu/sol/therm/049/case-12.inp	0.99604	0.00056	0.99636	0.00036	-32	-0.48
nrg/heu/sol/therm/049/case-13.inp	0.99666	0.00054	0.99709	0.00033	-43	-0.68
nrg/heu/sol/therm/049/case-14.inp	0.99841	0.00045	0.99793	0.00033	48	0.86
nrg/heu/sol/therm/049/case-15.inp	1.00060	0.00049	1.00059	0.00031	1	0.02
nrg/heu/sol/therm/049/case-16.inp	0.99922	0.00055	0.99898	0.00032	24	0.38
nrg/heu/sol/therm/049/case-17.inp	0.99702	0.00055	0.99843	0.00031	-141	-2.23
nrg/heu/sol/therm/049/case-18.inp	1.00034	0.00044	1.00017	0.00030	17	0.32
nrg/heu/sol/therm/049/case-19.inp	1.00074	0.00049	1.00115	0.00029	-41	-0.72
nrg/heu/sol/therm/049/case-2.inp	0.99032	0.00050	0.99095	0.00039	-63	-0.99
nrg/heu/sol/therm/049/case-20.inp	0.99962	0.00039	0.99898	0.00028	64	1.33
nrg/heu/sol/therm/049/case-3.inp	0.99826	0.00052	0.99783	0.00038	43	0.67
nrg/heu/sol/therm/049/case-4.inp	0.99895	0.00048	0.99908	0.00034	-13	-0.22
nrg/heu/sol/therm/049/case-5.inp	1.00048	0.00054	1.00135	0.00032	-87	-1.39
nrg/heu/sol/therm/049/case-6.inp	1.00567	0.00053	1.00463	0.00030	104	1.71
nrg/heu/sol/therm/049/case-7.inp	1.00493	0.00048	1.00576	0.00032	-83	-1.44
nrg/heu/sol/therm/049/case-8.inp	1.00349	0.00054	1.00415	0.00031	-66	-1.06
nrg/heu/sol/therm/049/case-9.inp	0.99833	0.00052	0.99795	0.00039	38	0.58
nrg/heu/sol/therm/050/case-01.inp	1.00760	0.00059	1.00754	0.00036	6	0.09
nrg/heu/sol/therm/050/case-02.inp	1.00187	0.00054	1.00208	0.00037	-21	-0.32
nrg/heu/sol/therm/050/case-03.inp	1.00484	0.00055	1.00446	0.00034	38	0.59
nrg/heu/sol/therm/050/case-04.inp	1.00395	0.00058	1.00391	0.00036	4	0.06
nrg/heu/sol/therm/050/case-05.inp	1.00103	0.00060	1.00081	0.00038	22	0.31
nrg/heu/sol/therm/050/case-06.inp	1.00947	0.00060	1.00859	0.00036	88	1.26
nrg/heu/sol/therm/050/case-07.inp	0.99688	0.00054	0.99835	0.00037	-147	-2.25
nrg/heu/sol/therm/050/case-08.inp	0.99814	0.00057	0.99826	0.00037	-12	-0.18

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/heu/sol/therm/050/case-09.inp	0.99716	0.00055	0.99694	0.00036	22	0.33
nrg/heu/sol/therm/050/case-10.inp	0.97961	0.00054	0.98033	0.00037	-72	-1.10
nrg/heu/sol/therm/050/case-11.inp	0.99187	0.00063	0.99126	0.00037	61	0.83
nrg/ieu/comp/fast/001/inp.inp	0.99284	0.00010	0.99044	0.00021	240	10.32
nrg/ieu/comp/fast/004/inp.inp	1.00028	0.00030	0.99742	0.00026	286	7.20
nrg/ieu/comp/inter/001/case-1.inp	0.98152	0.00017	0.97101	0.00012	1051	50.51
nrg/ieu/comp/inter/001/case-2.inp	0.97987	0.00021	0.96101	0.00013	1886	76.36
nrg/ieu/comp/inter/001/case-3.inp	1.01843	0.00031	0.99191	0.00020	2652	71.89
nrg/ieu/comp/inter/001/case-4.inp	0.93787	0.00028	0.93854	0.00027	-67	-1.72
nrg/ieu/comp/therm/015/case1.inp	0.98200	0.00058	0.98122	0.00032	78	1.18
nrg/ieu/comp/therm/015/case10.inp	0.99853	0.00049	1.03427	0.00036	-3574	-58.78
nrg/ieu/comp/therm/015/case11.inp	1.00069	0.00046	1.03112	0.00036	-3043	-52.10
nrg/ieu/comp/therm/015/case12.inp	1.00063	0.00050	1.02960	0.00035	-2897	-47.47
nrg/ieu/comp/therm/015/case13.inp	0.99796	0.00050	1.02864	0.00036	-3068	-49.80
nrg/ieu/comp/therm/015/case14.inp	1.00066	0.00056	1.03109	0.00036	-3043	-45.71
nrg/ieu/comp/therm/015/case15.inp	0.99908	0.00052	1.03270	0.00037	-3362	-52.68
nrg/ieu/comp/therm/015/case16.inp	0.99396	0.00046	1.02726	0.00037	-3330	-56.41
nrg/ieu/comp/therm/015/case17.inp	0.99572	0.00045	1.02536	0.00036	-2964	-51.43
nrg/ieu/comp/therm/015/case18.inp	0.99182	0.00051	1.02392	0.00036	-3210	-51.42
nrg/ieu/comp/therm/015/case19.inp	0.99718	0.00042	1.02795	0.00031	-3077	-58.94
nrg/ieu/comp/therm/015/case2.inp	0.98764	0.00053	0.98493	0.00035	271	4.27
nrg/ieu/comp/therm/015/case20.inp	0.99970	0.00049	1.03124	0.00030	-3154	-54.90
nrg/ieu/comp/therm/015/case21.inp	0.99464	0.00043	1.03157	0.00031	-3693	-69.67
nrg/ieu/comp/therm/015/case22.inp	0.99427	0.00049	1.03201	0.00031	-3774	-65.09
nrg/ieu/comp/therm/015/case23.inp	0.99439	0.00045	1.02470	0.00034	-3031	-53.74
nrg/ieu/comp/therm/015/case24.inp	0.99429	0.00054	1.02882	0.00034	-3453	-54.11
nrg/ieu/comp/therm/015/case25.inp	0.99974	0.00049	1.02740	0.00036	-2766	-45.49
nrg/ieu/comp/therm/015/case26.inp	0.99851	0.00044	1.02490	0.00036	-2639	-46.42
nrg/ieu/comp/therm/015/case27.inp	0.99210	0.00056	0.99738	0.00038	-528	-7.80
nrg/ieu/comp/therm/015/case28.inp	1.00024	0.00051	1.00751	0.00036	-727	-11.65
nrg/ieu/comp/therm/015/case3.inp	0.98775	0.00050	0.98280	0.00036	495	8.03
nrg/ieu/comp/therm/015/case4.inp	0.99532	0.00046	1.03481	0.00033	-3949	-69.75
nrg/ieu/comp/therm/015/case5.inp	0.99412	0.00050	1.03332	0.00032	-3920	-66.03
nrg/ieu/comp/therm/015/case6.inp	0.99133	0.00046	1.02515	0.00035	-3382	-58.51
nrg/ieu/comp/therm/015/case7.inp	0.99435	0.00046	1.03237	0.00033	-3802	-67.16
nrg/ieu/comp/therm/015/case8.inp	0.99777	0.00052	1.03354	0.00037	-3577	-56.05
nrg/ieu/comp/therm/015/case9.inp	0.99750	0.00051	1.02967	0.00036	-3217	-51.53
nrg/ieu/met/fast/001/case-1.inp	1.00019	0.00033	1.00049	0.00027	-30	-0.70
nrg/ieu/met/fast/001/case-1i.inp	1.00090	0.00032	1.00112	0.00027	-22	-0.53
nrg/ieu/met/fast/001/case-2.inp	1.00030	0.00035	1.00108	0.00027	-78	-1.76
nrg/ieu/met/fast/001/case-2i.inp	1.00099	0.00033	1.00073	0.00027	26	0.61
nrg/ieu/met/fast/001/case-3i.inp	1.00112	0.00029	1.00171	0.00026	-59	-1.51
nrg/ieu/met/fast/001/case-4.inp	1.00108	0.00034	1.00186	0.00027	-78	-1.80

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/ieu/met/fast/001/case-4i.inp	1.00155	0.00033	1.00164	0.00026	-9	-0.21
nrg/ieu/met/fast/002/case-1.inp	0.99910	0.00019	0.99845	0.00023	65	2.18
nrg/ieu/met/fast/003/inp.inp	1.00249	0.00030	1.00316	0.00026	-67	-1.69
nrg/ieu/met/fast/004/inp.inp	1.00748	0.00033	1.00582	0.00024	166	4.07
nrg/ieu/met/fast/005/inp.inp	1.00259	0.00029	1.00201	0.00024	58	1.54
nrg/ieu/met/fast/006/inp.inp	0.99651	0.00027	0.99613	0.00025	38	1.03
nrg/ieu/met/fast/007/detail.inp	1.00420	0.00012	1.00055	0.00024	365	13.60
nrg/ieu/met/fast/007/simple.inp	1.00466	0.00011	1.00002	0.00024	464	17.58
nrg/ieu/met/fast/007/twozone.inp	0.99508	0.00011	0.99123	0.00023	385	15.10
nrg/ieu/met/fast/010/case-1.inp	0.99526	0.00016	0.99072	0.00022	454	16.69
nrg/ieu/met/fast/012/case-1.inp	1.00318	0.00017	1.00052	0.00025	266	8.80
nrg/ieu/met/fast/013/inp.inp	0.99761	0.00028	0.99387	0.00020	374	10.87
nrg/ieu/met/fast/014/case-1.inp	0.99720	0.00026	0.99492	0.00019	228	7.08
nrg/ieu/met/fast/014/case-2.inp	0.99510	0.00026	0.99207	0.00017	303	9.75
nrg/ieu/sol/therm/002/case-13.inp	1.00528	0.00049	1.00577	0.00031	-49	-0.85
nrg/ieu/sol/therm/002/case-5.inp	1.00421	0.00049	1.00407	0.00034	14	0.23
nrg/ieu/sol/therm/002/case-6.inp	0.99987	0.00049	0.99922	0.00037	65	1.06
nrg/ieu/sol/therm/002/case-7.inp	1.00058	0.00052	0.99991	0.00031	67	1.11
nrg/ieu/sol/therm/002/case-8.inp	1.00400	0.00034	1.00400	0.00022	0	0.00
nrg/ieu/sol/therm/002/case-9.inp	1.00786	0.00027	1.00835	0.00014	-49	-1.61
nrg/ieu/sol/therm/003/case1.inp	0.99001	0.00051	0.99117	0.00037	-116	-1.84
nrg/ieu/sol/therm/003/case10.inp	1.00031	0.00037	1.00005	0.00028	26	0.56
nrg/ieu/sol/therm/003/case11.inp	0.99708	0.00056	0.99692	0.00037	16	0.24
nrg/ieu/sol/therm/003/case12.inp	0.99211	0.00050	0.99308	0.00037	-97	-1.56
nrg/ieu/sol/therm/003/case13.inp	0.99224	0.00054	0.99305	0.00036	-81	-1.25
nrg/ieu/sol/therm/003/case14.inp	0.99640	0.00056	0.99673	0.00038	-33	-0.49
nrg/ieu/sol/therm/003/case15.inp	0.99663	0.00056	0.99661	0.00037	2	0.03
nrg/ieu/sol/therm/003/case16.inp	1.00004	0.00047	0.99893	0.00034	111	1.91
nrg/ieu/sol/therm/003/case17.inp	1.00047	0.00045	1.00083	0.00031	-36	-0.66
nrg/ieu/sol/therm/003/case18.inp	1.00097	0.00053	1.00120	0.00032	-23	-0.37
nrg/ieu/sol/therm/003/case19.inp	1.00310	0.00043	1.00376	0.00032	-66	-1.23
nrg/ieu/sol/therm/003/case2.inp	0.99488	0.00050	0.99459	0.00036	29	0.47
nrg/ieu/sol/therm/003/case20.inp	1.00441	0.00044	1.00453	0.00030	-12	-0.23
nrg/ieu/sol/therm/003/case21.inp	1.00469	0.00037	1.00496	0.00030	-27	-0.57
nrg/ieu/sol/therm/003/case22.inp	0.99901	0.00051	0.99951	0.00037	-50	-0.79
nrg/ieu/sol/therm/003/case23.inp	1.00175	0.00042	1.00177	0.00034	-2	-0.04
nrg/ieu/sol/therm/003/case24.inp	1.01165	0.00053	1.01146	0.00037	19	0.29
nrg/ieu/sol/therm/003/case25.inp	1.00890	0.00054	1.01105	0.00037	-215	-3.28
nrg/ieu/sol/therm/003/case26.inp	1.01266	0.00056	1.01217	0.00035	49	0.74
nrg/ieu/sol/therm/003/case27.inp	1.00887	0.00047	1.00836	0.00037	51	0.85
nrg/ieu/sol/therm/003/case28.inp	1.00863	0.00045	1.00916	0.00037	-53	-0.91
nrg/ieu/sol/therm/003/case29.inp	1.01099	0.00047	1.00981	0.00037	118	1.97
nrg/ieu/sol/therm/003/case3.inp	1.00036	0.00052	1.00004	0.00034	32	0.52

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/ieu/sol/therm/003/case30.inp	1.00908	0.00052	1.00877	0.00036	31	0.49
nrg/ieu/sol/therm/003/case31.inp	0.99275	0.00056	0.99249	0.00037	26	0.39
nrg/ieu/sol/therm/003/case32.inp	0.99675	0.00060	0.99615	0.00036	60	0.86
nrg/ieu/sol/therm/003/case33.inp	1.00439	0.00049	1.00406	0.00036	33	0.54
nrg/ieu/sol/therm/003/case34.inp	0.99830	0.00055	0.99896	0.00034	-66	-1.02
nrg/ieu/sol/therm/003/case35.inp	0.99668	0.00043	0.99713	0.00031	-45	-0.85
nrg/ieu/sol/therm/003/case36.inp	1.00094	0.00044	1.00237	0.00027	-143	-2.77
nrg/ieu/sol/therm/003/case37.inp	1.00033	0.00043	0.99954	0.00025	79	1.59
nrg/ieu/sol/therm/003/case38.inp	0.99635	0.00063	0.99541	0.00037	94	1.29
nrg/ieu/sol/therm/003/case39.inp	0.99436	0.00055	0.99517	0.00036	-81	-1.23
nrg/ieu/sol/therm/003/case4.inp	0.99753	0.00044	0.99722	0.00034	31	0.56
nrg/ieu/sol/therm/003/case40.inp	0.99953	0.00056	0.99902	0.00037	51	0.76
nrg/ieu/sol/therm/003/case41.inp	0.99972	0.00056	0.99870	0.00037	102	1.52
nrg/ieu/sol/therm/003/case42.inp	1.00100	0.00053	1.00114	0.00036	-14	-0.22
nrg/ieu/sol/therm/003/case43.inp	1.00134	0.00054	1.00125	0.00031	9	0.14
nrg/ieu/sol/therm/003/case44.inp	1.00035	0.00052	1.00000	0.00031	35	0.58
nrg/ieu/sol/therm/003/case45.inp	1.00625	0.00052	1.00599	0.00037	26	0.41
nrg/ieu/sol/therm/003/case46.inp	0.99797	0.00043	0.99883	0.00030	-86	-1.64
nrg/ieu/sol/therm/003/case5.inp	0.99940	0.00041	0.99925	0.00031	15	0.29
nrg/ieu/sol/therm/003/case6.inp	1.00317	0.00042	1.00340	0.00028	-23	-0.46
nrg/ieu/sol/therm/003/case7.inp	1.00320	0.00037	1.00260	0.00027	60	1.31
nrg/ieu/sol/therm/003/case8.inp	1.00282	0.00041	1.00311	0.00026	-29	-0.60
nrg/ieu/sol/therm/003/case9.inp	1.00001	0.00044	0.99970	0.00035	31	0.55
nrg/ieu/sol/therm/004/case1.inp	1.00944	0.00036	1.00934	0.00027	10	0.22
nrg/leu/sol/therm/001/inp.inp	1.01189	0.00011	1.01139	0.00027	50	0.58
nrg/leu/sol/therm/003/case-1.inp	0.99663	0.00023	0.99608	0.00023	55	1.69
nrg/leu/sol/therm/003/case-2.inp	0.99528	0.00021	0.99545	0.00021	-17	0.57
nrg/leu/sol/therm/003/case-3.inp	0.99969	0.00021	0.99985	0.00021	-16	0.54
nrg/leu/sol/therm/003/case-4.inp	0.99317	0.00021	0.99314	0.00020	3	0.10
nrg/leu/sol/therm/003/case-5.inp	0.99773	0.00017	0.99735	0.00018	38	1.53
nrg/leu/sol/therm/003/case-6.inp	0.99835	0.00017	0.99840	0.00017	-5	0.21
nrg/leu/sol/therm/003/case-7.inp	0.99649	0.00016	0.99644	0.00016	5	0.22
nrg/leu/sol/therm/003/case-8.inp	1.00034	0.00014	0.99997	0.00013	37	1.94
nrg/leu/sol/therm/003/case-9.inp	0.99721	0.00014	0.99730	0.00013	-9	0.47
nrg/leu/sol/therm/007/case-14.inp	0.99451	0.00022	0.99468	0.00022	-17	-0.55
nrg/leu/sol/therm/007/case-30.inp	0.99722	0.00010	0.99669	0.00022	53	2.19
nrg/leu/sol/therm/007/case-32.inp	0.99543	0.00021	0.99585	0.00022	-42	-1.38
nrg/leu/sol/therm/007/case-36.inp	0.99859	0.00020	0.99821	0.00020	38	1.34
nrg/leu/sol/therm/007/case-49.inp	0.99725	0.00018	0.99747	0.00019	-22	-0.84
nrg/leu/sol/therm/016/case-105.inp	1.00500	0.00025	1.00522	0.00030	-22	-0.56
nrg/leu/sol/therm/016/case-113.inp	1.00517	0.00024	1.00438	0.00029	79	2.10
nrg/leu/sol/therm/016/case-125.inp	1.00431	0.00010	1.00430	0.00028	1	0.03
nrg/leu/sol/therm/016/case-129.inp	1.00338	0.00022	1.00309	0.00026	29	0.85

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/leu/sol/therm/016/case-131.inp	1.00309	0.00022	1.00343	0.00026	-34	-1.00
nrg/leu/sol/therm/016/case-140.inp	1.00125	0.00021	1.00096	0.00026	29	0.87
nrg/leu/sol/therm/016/case-196.inp	1.00317	0.00021	1.00248	0.00025	69	2.11
nrg/leu/sol/therm/017/case-104.inp	1.00256	0.00025	1.00177	0.00026	79	2.19
nrg/leu/sol/therm/017/case-122.inp	1.00169	0.00025	1.00186	0.00025	-17	-0.48
nrg/leu/sol/therm/017/case-123.inp	1.00063	0.00023	1.00037	0.00025	26	0.77
nrg/leu/sol/therm/017/case-126.inp	1.00122	0.00022	1.00168	0.00024	-46	-1.41
nrg/leu/sol/therm/017/case-130.inp	1.00091	0.00022	1.00135	0.00023	-44	-1.38
nrg/leu/sol/therm/017/case-147.inp	1.00119	0.00022	1.00087	0.00023	32	1.01
nrg/leu/sol/therm/018/case-1.inp	1.00149	0.00021	1.00101	0.00023	48	1.54
nrg/leu/sol/therm/018/case-2.inp	1.00139	0.00022	1.00168	0.00023	-29	-0.91
nrg/leu/sol/therm/018/case-3.inp	1.00170	0.00021	1.00163	0.00023	7	0.22
nrg/leu/sol/therm/018/case-4.inp	1.00190	0.00022	1.00184	0.00022	6	0.19
nrg/leu/sol/therm/018/case-5.inp	1.00145	0.00021	1.00139	0.00024	6	0.19
nrg/leu/sol/therm/018/case-6.inp	1.00135	0.00021	1.00115	0.00024	20	0.63
nrg/leu/sol/therm/019/run149.inp	1.00287	0.00038	1.00170	0.00023	117	2.63
nrg/leu/sol/therm/019/run150.inp	1.00245	0.00037	1.00245	0.00023	0	0.00
nrg/leu/sol/therm/019/run151.inp	1.00211	0.00034	1.00292	0.00024	-81	-1.95
nrg/leu/sol/therm/019/run152.inp	1.00314	0.00035	1.00249	0.00024	65	1.53
nrg/leu/sol/therm/019/run153.inp	1.00343	0.00035	1.00250	0.00024	93	2.19
nrg/leu/sol/therm/019/run183.inp	1.00094	0.00037	1.00132	0.00024	-38	-0.86
nrg/leu/sol/therm/020/case-216.inp	0.99978	0.00020	0.99909	0.00023	69	2.26
nrg/leu/sol/therm/020/case-217.inp	0.99922	0.00018	0.99963	0.00021	-41	-1.48
nrg/leu/sol/therm/020/case-220.inp	0.99932	0.00017	0.99848	0.00018	84	3.39
nrg/leu/sol/therm/020/case-226.inp	0.99999	0.00015	0.99964	0.00019	35	1.45
nrg/leu/sol/therm/021/case-215.inp	0.99752	0.00008	0.99755	0.00020	-3	-0.14
nrg/leu/sol/therm/021/case-218.inp	0.99781	0.00019	0.99814	0.00019	-33	-1.23
nrg/leu/sol/therm/021/case-221.inp	0.99743	0.00017	0.99739	0.00017	4	0.17
nrg/leu/sol/therm/021/case-223.inp	0.99927	0.00017	0.99955	0.00016	-28	-1.20
nrg/leu/sol/therm/022/case-1.inp	1.00315	0.00038	1.00272	0.00024	43	0.96
nrg/leu/sol/therm/022/case-2.inp	1.00313	0.00035	1.00313	0.00023	0	0.00
nrg/leu/sol/therm/022/case-3.inp	1.00241	0.00040	1.00278	0.00024	-37	-0.79
nrg/leu/sol/therm/022/case-4.inp	1.00384	0.00040	1.00296	0.00024	88	1.89
nrg/mix/comp/fast/001/inp.inp	0.98716	0.00015	0.98510	0.00021	206	7.98
nrg/mix/comp/fast/002/inp.inp	0.98599	0.00024	0.98337	0.00022	262	8.05
nrg/mix/comp/therm/012/case-1.inp	0.97295	0.00013	0.99252	0.00027	-1957	-65.31
nrg/mix/comp/therm/012/case-10.inp	1.02382	0.00012	1.02895	0.00029	-513	-16.35
nrg/mix/comp/therm/012/case-11.inp	1.02237	0.00013	1.02727	0.00027	-490	-16.35
nrg/mix/comp/therm/012/case-12.inp	1.02496	0.00013	1.02885	0.00028	-389	-12.60
nrg/mix/comp/therm/012/case-13.inp	1.03316	0.00013	1.03526	0.00028	-210	-6.80
nrg/mix/comp/therm/012/case-14.inp	1.01891	0.00014	1.04788	0.00030	-2897	-87.51
nrg/mix/comp/therm/012/case-15.inp	1.01854	0.00014	1.04876	0.00031	-3022	-88.84
nrg/mix/comp/therm/012/case-16.inp	1.01539	0.00014	1.04720	0.00030	-3181	-96.09

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/mix/comp/therm/012/case-17.inp	1.01530	0.00014	1.04781	0.00031	-3251	-95.58
nrg/mix/comp/therm/012/case-18.inp	1.01460	0.00014	1.04859	0.00030	-3399	-102.67
nrg/mix/comp/therm/012/case-19.inp	1.01381	0.00014	1.04898	0.00031	-3517	-103.40
nrg/mix/comp/therm/012/case-2.inp	0.97425	0.00014	0.99325	0.00028	-1900	-60.69
nrg/mix/comp/therm/012/case-20.inp	1.01493	0.00015	1.01897	0.00033	-404	-11.15
nrg/mix/comp/therm/012/case-21.inp	1.01367	0.00007	1.01764	0.00031	-397	-12.49
nrg/mix/comp/therm/012/case-22.inp	1.01081	0.00016	1.01517	0.00032	-436	-12.19
nrg/mix/comp/therm/012/case-23.inp	1.00794	0.00014	1.04212	0.00032	-3418	-97.86
nrg/mix/comp/therm/012/case-24.inp	1.00895	0.00014	1.04326	0.00032	-3431	-98.23
nrg/mix/comp/therm/012/case-25.inp	1.00748	0.00014	1.04367	0.00031	-3619	-106.40
nrg/mix/comp/therm/012/case-26.inp	1.00575	0.00014	1.04381	0.00032	-3806	-108.97
nrg/mix/comp/therm/012/case-27.inp	1.00564	0.00014	1.04701	0.00032	-4137	-118.44
nrg/mix/comp/therm/012/case-28.inp	1.00796	0.00015	1.05033	0.00031	-4237	-123.03
nrg/mix/comp/therm/012/case-29.inp	1.00720	0.00014	1.05103	0.00031	-4383	-128.86
nrg/mix/comp/therm/012/case-3.inp	0.97142	0.00014	0.99139	0.00027	-1997	-65.66
nrg/mix/comp/therm/012/case-30.inp	1.00619	0.00014	1.04582	0.00033	-3963	-110.55
nrg/mix/comp/therm/012/case-31.inp	0.99535	0.00015	1.00266	0.00033	-731	-20.17
nrg/mix/comp/therm/012/case-32.inp	0.99641	0.00017	1.00340	0.00032	-699	-19.29
nrg/mix/comp/therm/012/case-33.inp	0.99240	0.00016	0.99970	0.00033	-730	-19.90
nrg/mix/comp/therm/012/case-4.inp	0.97568	0.00013	0.99474	0.00028	-1906	-61.74
nrg/mix/comp/therm/012/case-5.inp	0.97402	0.00013	0.99256	0.00028	-1854	-60.06
nrg/mix/comp/therm/012/case-6.inp	0.97850	0.00013	0.99590	0.00029	-1740	-54.75
nrg/mix/comp/therm/012/case-7.inp	1.03156	0.00013	1.03305	0.00028	-149	-4.83
nrg/mix/comp/therm/012/case-8.inp	1.02623	0.00013	1.02941	0.00028	-318	-10.30
nrg/mix/comp/therm/012/case-9.inp	1.02413	0.00013	1.02906	0.00027	-493	-16.45
nrg/mix/met/fast/001/case-1.inp	0.99972	0.00034	0.99961	0.00031	11	0.24
nrg/mix/met/fast/002/case-1.inp	1.00551	0.00033	1.00607	0.00033	-56	-1.20
nrg/mix/met/fast/002/case-2.inp	1.00515	0.00031	1.00564	0.00034	-49	-1.06
nrg/mix/met/fast/002/case-3.inp	1.00431	0.00036	1.00588	0.00034	-157	-3.17
nrg/mix/met/fast/003/inp.inp	1.00028	0.00033	1.00142	0.00030	-114	-2.56
nrg/mix/met/fast/007/case-1.inp	1.00317	0.00044	1.00463	0.00033	-146	-2.65
nrg/mix/met/fast/007/case-10.inp	1.00486	0.00034	1.00568	0.00033	-82	-1.73
nrg/mix/met/fast/007/case-11.inp	1.00369	0.00038	1.00467	0.00031	-98	-2.00
nrg/mix/met/fast/007/case-12.inp	1.00181	0.00034	1.00225	0.00030	-44	-0.97
nrg/mix/met/fast/007/case-13.inp	1.00056	0.00035	1.00099	0.00031	-43	-0.92
nrg/mix/met/fast/007/case-14.inp	1.00761	0.00032	1.00826	0.00032	-65	-1.44
nrg/mix/met/fast/007/case-15.inp	1.00789	0.00037	1.00859	0.00032	-70	-1.43
nrg/mix/met/fast/007/case-16.inp	1.00577	0.00038	1.00654	0.00031	-77	-1.57
nrg/mix/met/fast/007/case-17.inp	1.00622	0.00040	1.00667	0.00030	-45	-0.90
nrg/mix/met/fast/007/case-18.inp	1.00773	0.00034	1.00787	0.00030	-14	-0.31
nrg/mix/met/fast/007/case-19.inp	1.00665	0.00032	1.00743	0.00032	-78	-1.72
nrg/mix/met/fast/007/case-2.inp	1.00757	0.00038	1.00920	0.00034	-163	-3.20
nrg/mix/met/fast/007/case-20.inp	1.00456	0.00038	1.00473	0.00031	-17	-0.35

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/mix/met/fast/007/case-21.inp	1.00452	0.00033	1.00544	0.00030	-92	-2.06
nrg/mix/met/fast/007/case-22.inp	1.00444	0.00038	1.00402	0.00032	42	0.85
nrg/mix/met/fast/007/case-23.inp	1.00383	0.00029	1.00357	0.00031	26	0.61
nrg/mix/met/fast/007/case-3.inp	1.00623	0.00037	1.00675	0.00031	-52	-1.08
nrg/mix/met/fast/007/case-4.inp	1.00541	0.00034	1.00568	0.00031	-27	-0.59
nrg/mix/met/fast/007/case-5.inp	1.00333	0.00036	1.00252	0.00032	81	1.68
nrg/mix/met/fast/007/case-6.inp	1.00066	0.00035	1.00146	0.00030	-80	-1.74
nrg/mix/met/fast/007/case-7.inp	1.00663	0.00044	1.00734	0.00033	-71	-1.29
nrg/mix/met/fast/007/case-8.inp	1.00537	0.00038	1.00562	0.00033	-25	-0.50
nrg/mix/met/fast/007/case-9.inp	1.00487	0.00035	1.00577	0.00032	-90	-1.90
nrg/mix/met/fast/008/core-8H.inp	1.01973	0.00019	1.00890	0.00016	1083	43.60
nrg/mix/met/fast/011/case-1.inp	0.99052	0.00017	0.98680	0.00032	372	10.27
nrg/mix/met/fast/011/case-2.inp	0.99692	0.00016	0.99309	0.00032	383	10.71
nrg/mix/met/fast/011/case-3.inp	1.00126	0.00014	0.99730	0.00031	396	11.64
nrg/mix/met/fast/011/case-4.inp	1.00322	0.00016	0.99938	0.00031	384	11.01
nrg/mix/sol/therm/001/inp_100f.inp	1.00632	0.00046	1.00627	0.00034	5	0.09
nrg/mix/sol/therm/001/inp_108f.inp	0.99524	0.00046	0.99571	0.00031	-47	-0.85
nrg/mix/sol/therm/001/inp_87f.inp	0.99465	0.00043	0.99502	0.00032	-37	-0.69
nrg/mix/sol/therm/001/inp_87sf.inp	0.99516	0.00049	0.99547	0.00033	-31	-0.52
nrg/mix/sol/therm/001/inp_91f.inp	0.99053	0.00045	0.99056	0.00034	-3	-0.05
nrg/mix/sol/therm/001/inp_92f.inp	0.99395	0.00050	0.99448	0.00033	-53	-0.88
nrg/mix/sol/therm/001/inp_93f.inp	0.99836	0.00043	0.99886	0.00033	-50	-0.92
nrg/mix/sol/therm/001/inp_94f.inp	0.99814	0.00052	0.99935	0.00032	-121	-1.98
nrg/mix/sol/therm/001/inp_95f.inp	1.00048	0.00046	1.00040	0.00035	8	0.14
nrg/mix/sol/therm/001/inp_96f.inp	0.99961	0.00046	0.99997	0.00034	-36	-0.63
nrg/mix/sol/therm/001/inp_97f.inp	0.99856	0.00049	0.99885	0.00032	-29	-0.50
nrg/mix/sol/therm/001/inp_98f.inp	1.00008	0.00041	0.99927	0.00032	81	1.56
nrg/mix/sol/therm/001/inp_99f.inp	1.00485	0.00046	1.00517	0.00031	-32	-0.58
nrg/mix/sol/therm/002/exp-58.inp	1.00146	0.00017	1.00132	0.00018	14	0.57
nrg/mix/sol/therm/002/exp-59.inp	1.00166	0.00016	1.00166	0.00018	0	0.00
nrg/mix/sol/therm/002/exp-61.inp	1.00177	0.00017	1.00134	0.00018	43	1.74
nrg/mix/sol/therm/004/inp_66.inp	0.99553	0.00046	0.99588	0.00034	-35	-0.61
nrg/mix/sol/therm/004/inp_69.inp	0.99486	0.00044	0.99522	0.00036	-36	-0.63
nrg/mix/sol/therm/004/inp_78.inp	0.99559	0.00054	0.99640	0.00036	-81	-1.25
nrg/mix/sol/therm/006/c1.inp	0.99701	0.00044	0.99671	0.00031	30	0.56
nrg/mix/sol/therm/006/c2.inp	1.00010	0.00047	0.99953	0.00027	57	1.05
nrg/mix/sol/therm/006/c3.inp	1.00095	0.00045	1.00003	0.00025	92	1.79
nrg/mix/sol/therm/006/c4.inp	1.00134	0.00039	1.00063	0.00023	71	1.57
nrg/mix/sol/therm/006/c5.inp	0.99953	0.00044	0.99976	0.00020	-23	-0.48
nrg/mix/sol/therm/006/c6.inp	0.99912	0.00046	0.99929	0.00020	-17	-0.34
nrg/mix/sol/therm/007/case-1.inp	0.99434	0.00049	0.99511	0.00034	-77	-1.29
nrg/mix/sol/therm/007/case-2.inp	0.99149	0.00049	0.99145	0.00030	4	0.07
nrg/mix/sol/therm/007/case-3.inp	1.00067	0.00048	1.00044	0.00026	23	0.42

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/mix/sol/therm/007/case-4.inp	0.99812	0.00046	0.99893	0.00024	-81	-1.56
nrg/mix/sol/therm/007/case-5.inp	0.99733	0.00044	0.99661	0.00024	72	1.44
nrg/mix/sol/therm/007/case-6.inp	0.99614	0.00044	0.99605	0.00022	9	0.18
nrg/mix/sol/therm/007/case-7.inp	0.99375	0.00036	0.99259	0.00021	116	2.78
nrg/pu/comp/inter/001/inp.inp	1.01089	0.00017	1.01203	0.00012	-114	-5.48
nrg/pu/comp/mixed/001/case-1.inp	1.02453	0.00037	1.02570	0.00040	-117	-2.15
nrg/pu/comp/mixed/001/case-2.inp	1.02679	0.00048	1.02759	0.00038	-80	-1.31
nrg/pu/comp/mixed/001/case-3.inp	1.02436	0.00050	1.02658	0.00037	-222	-3.57
nrg/pu/comp/mixed/001/case-4.inp	0.99352	0.00048	0.99815	0.00036	-463	-7.72
nrg/pu/comp/mixed/001/case-5.inp	1.01106	0.00050	1.02550	0.00034	-1444	-23.88
nrg/pu/met/fast/002/inp.inp	1.00024	0.00030	0.99998	0.00032	26	0.59
nrg/pu/met/fast/005/inp.inp	1.00054	0.00019	1.00110	0.00032	-56	-1.50
nrg/pu/met/fast/006/inp.inp	1.00083	0.00009	1.00180	0.00034	-97	-2.76
nrg/pu/met/fast/009/case-1.inp	1.00502	0.00029	1.00537	0.00031	-35	-0.82
nrg/pu/met/fast/010/case-1.inp	1.00045	0.00033	1.00016	0.00030	29	0.65
nrg/pu/met/fast/011/case-1.inp	1.00018	0.00045	1.01462	0.00039	-1444	-24.25
nrg/pu/met/fast/012/inp.inp	1.00291	0.00043	1.00363	0.00036	-72	-1.28
nrg/pu/met/fast/013/inp.inp	1.00895	0.00044	1.00919	0.00032	-24	-0.44
nrg/pu/met/fast/014/simple_case-1.inp	1.00710	0.00034	1.00729	0.00036	-19	-0.38
nrg/pu/met/fast/015/simple_case-1.inp	1.00022	0.00032	0.99998	0.00031	24	0.54
nrg/pu/met/fast/018/inp.inp	0.99968	0.00032	1.00037	0.00032	-69	-1.52
nrg/pu/met/fast/019/case-1.inp	1.00122	0.00034	1.00122	0.00032	0	0.00
nrg/pu/met/fast/020/case-1.inp	0.99866	0.00031	0.99844	0.00031	22	0.50
nrg/pu/met/fast/021/case-BeOReflected.inp	0.99302	0.00031	0.99400	0.00032	-98	-2.20
nrg/pu/met/fast/021/case-BeReflected.inp	1.00449	0.00034	1.00517	0.00031	-68	-1.48
nrg/pu/met/fast/022/case-LayeredModel.inp	0.99888	0.00027	0.99828	0.00031	60	1.46
nrg/pu/met/fast/022/case-SimplifiedModel.inp	0.99857	0.00029	0.99876	0.00030	-19	-0.46
nrg/pu/met/fast/023/case-LayeredModel.inp	0.99961	0.00034	0.99761	0.00030	200	4.41
nrg/pu/met/fast/023/case-SimplifiedModel.inp	1.00037	0.00033	0.99757	0.00030	280	6.28
nrg/pu/met/fast/024/case-LayeredModel.inp	1.00224	0.00036	1.00106	0.00032	118	2.45
nrg/pu/met/fast/024/case-SimplifiedModel.inp	1.00212	0.00041	1.00153	0.00031	59	1.15
nrg/pu/met/fast/025/case-LayeredModel.inp	0.99861	0.00032	0.99903	0.00031	-42	-0.94
nrg/pu/met/fast/025/case-SimplifiedModel.inp	0.99907	0.00032	0.99924	0.00031	-17	-0.38
nrg/pu/met/fast/026/case-LayeredModel.inp	0.99838	0.00034	0.99871	0.00030	-33	-0.73
nrg/pu/met/fast/026/case-SimplifiedModel.inp	0.99813	0.00035	0.99892	0.00031	-79	-1.69
nrg/pu/met/fast/027/case-LayeredModel.inp	1.00274	0.00036	1.01097	0.00033	-823	-16.85
nrg/pu/met/fast/027/case-SimplifiedModel.inp	1.00316	0.00040	1.01024	0.00032	-708	-13.82
nrg/pu/met/fast/028/case-LayeredModel.inp	0.99874	0.00033	0.99909	0.00031	-35	-0.77
nrg/pu/met/fast/028/case-SimplifiedModel.inp	0.99937	0.00031	0.99821	0.00030	116	2.69
nrg/pu/met/fast/029/case-LayeredModel.inp	0.99581	0.00029	0.99601	0.00031	-20	-0.47
nrg/pu/met/fast/029/case-SimplifiedModel.inp	0.99594	0.00030	0.99590	0.00032	4	0.09
nrg/pu/met/fast/030/case-LayeredModel.inp	1.00294	0.00031	1.00034	0.00030	260	6.03
nrg/pu/met/fast/030/case-SimplifiedModel.inp	1.00335	0.00030	1.00147	0.00031	188	4.36

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/pu/met/fast/031/case-LayeredModel.inp	1.00493	0.00036	1.00506	0.00032	-13	-0.27
nrg/pu/met/fast/031/case-SimplifiedModel.inp	1.00419	0.00035	1.00453	0.00031	-34	-0.73
nrg/pu/met/fast/032/case-LayeredModel.inp	0.99861	0.00037	0.99847	0.00031	14	0.29
nrg/pu/met/fast/032/case-SimplifiedModel.inp	0.99830	0.00031	0.99934	0.00031	-104	-2.37
nrg/pu/met/fast/033/case-1.inp	0.99558	0.00038	0.99316	0.00033	242	4.81
nrg/pu/met/fast/035/inp.inp	0.99760	0.00031	0.99761	0.00031	-1	-0.02
nrg/pu/met/fast/036/case-1.inp	1.00565	0.00035	1.00580	0.00031	-15	-0.32
nrg/pu/met/fast/038/case-SimplifiedModel.inp	0.99933	0.00034	1.00067	0.00033	-134	-2.83
nrg/pu/met/fast/039/case-1.inp	0.99182	0.00034	0.99220	0.00031	-38	-0.83
nrg/pu/met/fast/040/case-1.inp	0.99678	0.00031	0.99707	0.00031	-29	-0.66
nrg/pu/met/fast/041/case-1.inp	1.00594	0.00036	1.00673	0.00034	-79	-1.60
nrg/pu/met/fast/044/case-1.inp	1.00018	0.00033	0.99893	0.00032	125	2.72
nrg/pu/met/fast/044/case-2.inp	1.00028	0.00039	0.99717	0.00032	311	6.16
nrg/pu/met/fast/044/case-3.inp	0.99938	0.00038	0.99659	0.00033	279	5.54
nrg/pu/met/fast/044/case-4.inp	0.99918	0.00039	0.99842	0.00031	76	1.53
nrg/pu/met/fast/044/case-5.inp	1.00023	0.00039	0.99615	0.00032	408	8.09
nrg/pu/met/fast/045/detail_case-1-d.inp	1.01261	0.00033	1.01201	0.00038	60	1.19
nrg/pu/met/fast/045/detail_case-2-d.inp	1.01025	0.00034	1.01534	0.00039	-509	-9.84
nrg/pu/met/fast/045/detail_case-3-d.inp	1.01470	0.00035	1.01506	0.00042	-36	-0.66
nrg/pu/met/fast/045/detail_case-4-d.inp	1.01418	0.00031	1.01399	0.00039	19	0.38
nrg/pu/met/fast/045/detail_case-5-d.inp	1.01840	0.00042	1.01900	0.00040	-60	-1.03
nrg/pu/met/fast/045/detail_case-6-d.inp	1.01370	0.00034	1.01463	0.00041	-93	-1.75
nrg/pu/met/fast/045/detail_case-7-d.inp	1.01582	0.00039	1.01580	0.00039	2	0.04
nrg/pu/met/inter/002/case-1.inp	1.01477	0.00021	1.01321	0.00031	156	4.17
nrg/pu/met/inter/003/rz.inp	0.98795	0.00042	0.98389	0.00029	406	7.95
nrg/pu/met/inter/004/rz.inp	0.97482	0.00044	0.97147	0.00029	335	6.36
nrg/pu/sol/therm/001/case-1.inp	1.00507	0.00018	1.00530	0.00035	-23	-0.58
nrg/pu/sol/therm/001/case-2.inp	1.00719	0.00019	1.00709	0.00036	10	0.25
nrg/pu/sol/therm/001/case-3.inp	1.00988	0.00020	1.00913	0.00038	75	1.75
nrg/pu/sol/therm/001/case-4.inp	1.00348	0.00018	1.00384	0.00035	-36	-0.91
nrg/pu/sol/therm/001/case-5.inp	1.00783	0.00020	1.00844	0.00038	-61	-1.42
nrg/pu/sol/therm/001/case-6.inp	1.00898	0.00019	1.00913	0.00035	-15	-0.38
nrg/pu/sol/therm/002/case-1.inp	1.00390	0.00019	1.00416	0.00036	-26	-0.64
nrg/pu/sol/therm/002/case-2.inp	1.00483	0.00016	1.00509	0.00034	-26	-0.69
nrg/pu/sol/therm/002/case-3.inp	1.00390	0.00018	1.00365	0.00035	25	0.64
nrg/pu/sol/therm/002/case-4.inp	1.00660	0.00019	1.00644	0.00035	16	0.40
nrg/pu/sol/therm/002/case-5.inp	1.00908	0.00019	1.00823	0.00035	85	2.13
nrg/pu/sol/therm/002/case-6.inp	1.00505	0.00018	1.00522	0.00036	-17	-0.42
nrg/pu/sol/therm/002/case-7.inp	1.00738	0.00018	1.00768	0.00036	-30	-0.75
nrg/pu/sol/therm/003/case-1.inp	1.00287	0.00016	1.00241	0.00033	46	1.25
nrg/pu/sol/therm/003/case-2.inp	1.00262	0.00017	1.00155	0.00033	107	2.88
nrg/pu/sol/therm/003/case-3.inp	1.00510	0.00017	1.00468	0.00033	42	1.13
nrg/pu/sol/therm/003/case-4.inp	1.00424	0.00019	1.00432	0.00033	-8	-0.21

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/pu/sol/therm/003/case-5.inp	1.00547	0.00017	1.00505	0.00035	42	1.08
nrg/pu/sol/therm/003/case-6.inp	1.00592	0.00017	1.00548	0.00034	44	1.16
nrg/pu/sol/therm/003/case-7.inp	1.00656	0.00016	1.00661	0.00033	-5	-0.14
nrg/pu/sol/therm/003/case-8.inp	1.00588	0.00018	1.00595	0.00035	-7	-0.18
nrg/pu/sol/therm/004/case-1.inp	1.00385	0.00016	1.00361	0.00031	24	0.69
nrg/pu/sol/therm/004/case-10.inp	1.00199	0.00016	1.00204	0.00032	-5	-0.14
nrg/pu/sol/therm/004/case-11.inp	1.00061	0.00017	1.00020	0.00033	41	1.10
nrg/pu/sol/therm/004/case-12.inp	1.00278	0.00017	1.00283	0.00032	-5	-0.14
nrg/pu/sol/therm/004/case-13.inp	1.00023	0.00016	1.00015	0.00032	8	0.22
nrg/pu/sol/therm/004/case-2.inp	0.99839	0.00016	0.99847	0.00031	-8	-0.23
nrg/pu/sol/therm/004/case-3.inp	1.00104	0.00017	1.00040	0.00032	64	1.77
nrg/pu/sol/therm/004/case-4.inp	0.99883	0.00016	0.99831	0.00032	52	1.45
nrg/pu/sol/therm/004/case-5.inp	0.99994	0.00016	0.99919	0.00031	75	2.15
nrg/pu/sol/therm/004/case-6.inp	1.00168	0.00016	1.00127	0.00032	41	1.15
nrg/pu/sol/therm/004/case-7.inp	1.00542	0.00015	1.00542	0.00032	0	0.00
nrg/pu/sol/therm/004/case-8.inp	1.00126	0.00017	1.00169	0.00031	-43	-1.22
nrg/pu/sol/therm/004/case-9.inp	1.00064	0.00017	1.00024	0.00031	40	1.13
nrg/pu/sol/therm/005/case-1.inp	1.00244	0.00016	1.00202	0.00031	42	1.20
nrg/pu/sol/therm/005/case-2.inp	1.00294	0.00017	1.00293	0.00032	1	0.03
nrg/pu/sol/therm/005/case-3.inp	1.00333	0.00016	1.00417	0.00031	-84	-2.41
nrg/pu/sol/therm/005/case-4.inp	1.00504	0.00017	1.00488	0.00032	16	0.44
nrg/pu/sol/therm/005/case-5.inp	1.00633	0.00015	1.00631	0.00032	2	0.06
nrg/pu/sol/therm/005/case-6.inp	1.00575	0.00018	1.00422	0.00033	153	4.07
nrg/pu/sol/therm/005/case-7.inp	1.00379	0.00017	1.00375	0.00032	4	0.11
nrg/pu/sol/therm/005/case-8.inp	0.99910	0.00017	0.99935	0.00033	-25	-0.67
nrg/pu/sol/therm/005/case-9.inp	1.00242	0.00017	1.00183	0.00032	59	1.63
nrg/pu/sol/therm/006/case-1.inp	1.00081	0.00015	1.00032	0.00031	49	1.42
nrg/pu/sol/therm/006/case-2.inp	1.00188	0.00016	1.00179	0.00030	9	0.26
nrg/pu/sol/therm/006/case-3.inp	1.00127	0.00015	1.00074	0.00030	53	1.58
nrg/pu/sol/therm/007/case-10.inp	1.00111	0.00019	1.00084	0.00036	27	0.66
nrg/pu/sol/therm/007/case-2.inp	1.00943	0.00020	1.00947	0.00037	-4	-0.10
nrg/pu/sol/therm/007/case-3.inp	1.00366	0.00020	1.00310	0.00037	56	1.33
nrg/pu/sol/therm/007/case-5.inp	1.00905	0.00019	1.00939	0.00036	-34	-0.84
nrg/pu/sol/therm/007/case-6.inp	1.00340	0.00019	1.00360	0.00036	-20	-0.49
nrg/pu/sol/therm/007/case-7.inp	1.00569	0.00020	1.00565	0.00036	4	0.10
nrg/pu/sol/therm/007/case-8.inp	0.99826	0.00017	0.99868	0.00036	-42	-1.05
nrg/pu/sol/therm/007/case-9.inp	0.99703	0.00019	0.99691	0.00036	12	0.29
nrg/pu/sol/therm/008/case-1.inp	1.00269	0.00017	1.00265	0.00030	4	0.12
nrg/pu/sol/therm/008/case-10.inp	1.02258	0.00017	1.02326	0.00031	-68	-1.92
nrg/pu/sol/therm/008/case-11.inp	1.01614	0.00016	1.01644	0.00030	-30	-0.88
nrg/pu/sol/therm/008/case-12.inp	1.01481	0.00020	1.01616	0.00032	-135	-3.58
nrg/pu/sol/therm/008/case-13.inp	1.02148	0.00019	1.02236	0.00032	-88	-2.36
nrg/pu/sol/therm/008/case-14.inp	1.00457	0.00020	1.00410	0.00033	47	1.22

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/pu/sol/therm/008/case-15.inp	1.01038	0.00019	1.01032	0.00032	6	0.16
nrg/pu/sol/therm/008/case-16.inp	1.00849	0.00016	1.00856	0.00028	-7	-0.22
nrg/pu/sol/therm/008/case-17.inp	1.01279	0.00019	1.01198	0.00030	81	2.28
nrg/pu/sol/therm/008/case-18.inp	1.01646	0.00019	1.01656	0.00031	-10	-0.28
nrg/pu/sol/therm/008/case-19.inp	1.00903	0.00015	1.00923	0.00029	-20	-0.61
nrg/pu/sol/therm/008/case-2.inp	1.00427	0.00017	1.00437	0.00031	-10	-0.28
nrg/pu/sol/therm/008/case-20.inp	1.00997	0.00015	1.01017	0.00031	-20	-0.58
nrg/pu/sol/therm/008/case-21.inp	0.99768	0.00020	0.99670	0.00032	98	2.60
nrg/pu/sol/therm/008/case-22.inp	0.99712	0.00018	0.99668	0.00032	44	1.20
nrg/pu/sol/therm/008/case-23.inp	1.01596	0.00016	1.01733	0.00031	-137	-3.93
nrg/pu/sol/therm/008/case-24.inp	1.00876	0.00017	1.00963	0.00031	-87	-2.46
nrg/pu/sol/therm/008/case-25.inp	1.01428	0.00019	1.01618	0.00033	-190	-4.99
nrg/pu/sol/therm/008/case-26.inp	1.01246	0.00017	1.01314	0.00033	-68	-1.83
nrg/pu/sol/therm/008/case-27.inp	1.01198	0.00020	1.01118	0.00034	80	2.03
nrg/pu/sol/therm/008/case-28.inp	1.00519	0.00020	1.00449	0.00033	70	1.81
nrg/pu/sol/therm/008/case-29.inp	1.01405	0.00019	1.01370	0.00031	35	0.96
nrg/pu/sol/therm/008/case-3.inp	1.01280	0.00017	1.01329	0.00031	-49	-1.39
nrg/pu/sol/therm/008/case-30.inp	1.01089	0.00018	1.01058	0.00031	31	0.86
nrg/pu/sol/therm/008/case-4.inp	1.01612	0.00017	1.01660	0.00030	-48	-1.39
nrg/pu/sol/therm/008/case-5.inp	1.01516	0.00017	1.01529	0.00028	-13	-0.40
nrg/pu/sol/therm/008/case-7.inp	1.01106	0.00016	1.01114	0.00030	-8	-0.24
nrg/pu/sol/therm/008/case-8.inp	0.99750	0.00020	0.99714	0.00031	36	0.98
nrg/pu/sol/therm/008/case-9.inp	1.00702	0.00018	1.00722	0.00031	-20	-0.56
nrg/pu/sol/therm/009/case-1.inp	1.01499	0.00008	1.01429	0.00014	70	4.34
nrg/pu/sol/therm/009/case-2.inp	1.01991	0.00008	1.01929	0.00012	62	4.30
nrg/pu/sol/therm/009/case-3.inp	1.01900	0.00008	1.01858	0.00012	42	2.91
nrg/pu/sol/therm/012/case-10.inp	1.00483	0.00015	1.00541	0.00026	-58	-1.93
nrg/pu/sol/therm/012/case-11.inp	1.00698	0.00013	1.00746	0.00022	-48	-1.88
nrg/pu/sol/therm/012/case-12.inp	1.00750	0.00014	1.00768	0.00021	-18	-0.71
nrg/pu/sol/therm/012/case-13.inp	1.01015	0.00009	1.00979	0.00014	36	2.16
nrg/pu/sol/therm/012/case-14.inp	1.00105	0.00019	1.00224	0.00031	-119	-3.27
nrg/pu/sol/therm/012/case-15.inp	1.00780	0.00016	1.00897	0.00030	-117	-3.44
nrg/pu/sol/therm/012/case-16.inp	1.00269	0.00015	1.00312	0.00029	-43	-1.32
nrg/pu/sol/therm/012/case-17.inp	1.00619	0.00014	1.00632	0.00025	-13	-0.45
nrg/pu/sol/therm/012/case-18.inp	1.00625	0.00013	1.00666	0.00023	-41	-1.55
nrg/pu/sol/therm/012/case-19.inp	1.00760	0.00011	1.00800	0.00023	-40	-1.57
nrg/pu/sol/therm/012/case-2.inp	1.00585	0.00012	1.00559	0.00020	26	1.11
nrg/pu/sol/therm/012/case-20.inp	1.00823	0.00013	1.00775	0.00020	48	2.01
nrg/pu/sol/therm/012/case-21.inp	1.00867	0.00011	1.00838	0.00018	29	1.37
nrg/pu/sol/therm/012/case-22.inp	1.01018	0.00009	1.00940	0.00015	78	4.46
nrg/pu/sol/therm/012/case-23.inp	1.00966	0.00010	1.00979	0.00015	-13	-0.72
nrg/pu/sol/therm/012/case-3.inp	1.00697	0.00012	1.00673	0.00020	24	1.03
nrg/pu/sol/therm/012/case-4.inp	1.00739	0.00012	1.00708	0.00018	31	1.43

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/pu/sol/therm/012/case-5.inp	1.00992	0.00009	1.00969	0.00015	23	1.31
nrg/pu/sol/therm/012/case-6.inp	1.00826	0.00017	1.00819	0.00031	7	0.20
nrg/pu/sol/therm/012/case-7.inp	1.00648	0.00018	1.00684	0.00031	-36	-1.00
nrg/pu/sol/therm/012/case-8.inp	1.00533	0.00018	1.00584	0.00030	-51	-1.46
nrg/pu/sol/therm/012/case-9.inp	1.01063	0.00016	1.01112	0.00026	-49	-1.61
nrg/pu/sol/therm/018/case-1.inp	1.00856	0.00017	1.01023	0.00027	-167	-5.23
nrg/pu/sol/therm/018/case-2.inp	1.01172	0.00017	1.01318	0.00026	-146	-4.70
nrg/pu/sol/therm/018/case-3.inp	1.00942	0.00018	1.01151	0.00027	-209	-6.44
nrg/pu/sol/therm/018/case-4.inp	1.00753	0.00018	1.00956	0.00025	-203	-6.59
nrg/pu/sol/therm/018/case-5.inp	1.00625	0.00016	1.00831	0.00024	-206	-7.14
nrg/pu/sol/therm/018/case-6.inp	1.00455	0.00015	1.00606	0.00024	-151	-5.34
nrg/pu/sol/therm/018/case-7.inp	1.00405	0.00016	1.00529	0.00024	-124	-4.30
nrg/pu/sol/therm/018/case-8.inp	1.00353	0.00016	1.00499	0.00022	-146	-5.37
nrg/pu/sol/therm/018/case-9.inp	1.00194	0.00015	1.00251	0.00022	-57	-2.14
nrg/pu/sol/therm/022/case-1.inp	0.99957	0.00018	1.00001	0.00032	-44	-1.20
nrg/pu/sol/therm/022/case-10.inp	0.99961	0.00018	1.00030	0.00033	-69	-1.84
nrg/pu/sol/therm/022/case-11.inp	0.99578	0.00018	0.99579	0.00033	-1	-0.03
nrg/pu/sol/therm/022/case-12.inp	0.99828	0.00018	0.99791	0.00032	37	1.01
nrg/pu/sol/therm/022/case-13.inp	0.99647	0.00016	0.99635	0.00032	12	0.34
nrg/pu/sol/therm/022/case-14.inp	0.99535	0.00019	0.99533	0.00032	2	0.05
nrg/pu/sol/therm/022/case-15.inp	0.99389	0.00016	0.99432	0.00031	-43	-1.23
nrg/pu/sol/therm/022/case-16.inp	0.99528	0.00018	0.99509	0.00031	19	0.53
nrg/pu/sol/therm/022/case-17.inp	0.99614	0.00018	0.99530	0.00030	84	2.40
nrg/pu/sol/therm/022/case-2.inp	1.00199	0.00018	0.99574	0.00032	625	17.02
nrg/pu/sol/therm/022/case-3.inp	1.00102	0.00018	1.00088	0.00031	14	0.39
nrg/pu/sol/therm/022/case-4.inp	1.00148	0.00017	0.99667	0.00031	481	13.60
nrg/pu/sol/therm/022/case-5.inp	1.00212	0.00017	1.00216	0.00029	-4	-0.12
nrg/pu/sol/therm/022/case-6.inp	1.00274	0.00016	1.00252	0.00028	22	0.68
nrg/pu/sol/therm/022/case-7.inp	1.00433	0.00015	1.00425	0.00027	8	0.26
nrg/pu/sol/therm/022/case-8.inp	1.00504	0.00015	1.00498	0.00027	6	0.19
nrg/pu/sol/therm/022/case-9.inp	1.00375	0.00015	1.00362	0.00026	13	0.43
nrg/pu/sol/therm/033/c01.inp	0.99751	0.00048	0.99646	0.00035	105	1.77
nrg/pu/sol/therm/033/c02.inp	0.99532	0.00052	0.99589	0.00036	-57	-0.90
nrg/pu/sol/therm/033/c03.inp	0.99236	0.00047	0.99434	0.00035	-198	-3.38
nrg/pu/sol/therm/033/c04.inp	0.99208	0.00053	0.99216	0.00035	-8	-0.13
nrg/pu/sol/therm/033/c05.inp	0.98899	0.00053	0.99033	0.00035	-134	-2.11
nrg/pu/sol/therm/033/c06.inp	0.99132	0.00054	0.99046	0.00035	86	1.34
nrg/pu/sol/therm/033/c07.inp	0.98979	0.00058	0.99102	0.00036	-123	-1.80
nrg/pu/sol/therm/033/c08.inp	0.99067	0.00055	0.99112	0.00036	-45	-0.68
nrg/pu/sol/therm/033/c09.inp	0.99263	0.00045	0.99347	0.00034	-84	-1.49
nrg/pu/sol/therm/033/c10.inp	0.99407	0.00053	0.99463	0.00035	-56	-0.88
nrg/pu/sol/therm/033/c11.inp	0.99328	0.00049	0.99350	0.00035	-22	-0.37
nrg/pu/sol/therm/033/c12.inp	0.99923	0.00048	0.99864	0.00036	59	0.98

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/pu/sol/therm/033/c13.inp	0.99387	0.00055	0.99434	0.00036	-47	-0.72
nrg/pu/sol/therm/033/c14.inp	0.99493	0.00046	0.99573	0.00036	-80	-1.37
nrg/pu/sol/therm/034/case-10.inp	0.99717	0.00017	0.99591	0.00027	126	3.95
nrg/pu/sol/therm/034/case-11.inp	0.99919	0.00016	0.99834	0.00026	85	2.78
nrg/pu/sol/therm/034/case-12.inp	0.99849	0.00015	0.99745	0.00025	104	3.57
nrg/pu/sol/therm/034/case-13.inp	0.99698	0.00016	0.99615	0.00025	83	2.80
nrg/pu/sol/therm/034/case-14.inp	0.99653	0.00014	0.99549	0.00024	104	3.74
nrg/pu/sol/therm/034/case-15.inp	0.99711	0.00014	0.99615	0.00024	96	3.46
nrg/u233/met/fast/001/inp.inp	0.99963	0.00008	0.99990	0.00031	-27	-0.84
nrg/u233/met/fast/002/case-1.inp	0.99886	0.00031	0.99888	0.00031	-2	-0.05
nrg/u233/met/fast/002/case-2.inp	1.00068	0.00032	1.00032	0.00030	36	0.82
nrg/u233/met/fast/003/case-1.inp	0.99803	0.00030	0.99850	0.00028	-47	-1.15
nrg/u233/met/fast/003/case-2.inp	0.99745	0.00031	0.99845	0.00030	-100	-2.32
nrg/u233/met/fast/004/case-1.inp	0.99934	0.00035	0.99933	0.00030	1	0.02
nrg/u233/met/fast/004/case-2.inp	0.99563	0.00036	0.99668	0.00029	-105	-2.27
nrg/u233/met/fast/005/case-1.inp	0.99615	0.00004	0.99607	0.00031	8	0.26
nrg/u233/met/fast/005/case-2.inp	0.99536	0.00005	0.99563	0.00032	-27	-0.83
nrg/u233/met/fast/006/inp.inp	0.99859	0.00009	0.99939	0.00035	-80	-2.21
nrg/u233/sol/inter/001/case-1.inp	0.98588	0.00053	0.98792	0.00042	-204	-3.02
nrg/u233/sol/inter/001/case-10.inp	0.97824	0.00060	0.97935	0.00042	-111	-1.52
nrg/u233/sol/inter/001/case-11.inp	0.98051	0.00065	0.97812	0.00040	239	3.13
nrg/u233/sol/inter/001/case-12.inp	0.98212	0.00058	0.98430	0.00040	-218	-3.09
nrg/u233/sol/inter/001/case-13.inp	0.98277	0.00059	0.98408	0.00041	-131	-1.82
nrg/u233/sol/inter/001/case-14.inp	0.99134	0.00062	0.98826	0.00040	308	4.17
nrg/u233/sol/inter/001/case-15.inp	0.98036	0.00055	0.98156	0.00040	-120	-1.76
nrg/u233/sol/inter/001/case-16.inp	0.98186	0.00051	1.01754	0.00039	-3568	-55.57
nrg/u233/sol/inter/001/case-17.inp	0.98867	0.00067	0.98620	0.00040	247	3.17
nrg/u233/sol/inter/001/case-18.inp	0.97960	0.00058	0.97972	0.00043	-12	-0.17
nrg/u233/sol/inter/001/case-19.inp	0.97653	0.00066	0.97592	0.00039	61	0.80
nrg/u233/sol/inter/001/case-2.inp	0.98070	0.00057	0.98232	0.00042	-162	-2.29
nrg/u233/sol/inter/001/case-20.inp	0.98081	0.00062	0.98055	0.00040	26	0.35
nrg/u233/sol/inter/001/case-21.inp	0.97319	0.00059	0.97350	0.00041	-31	-0.43
nrg/u233/sol/inter/001/case-22.inp	0.97869	0.00067	0.97842	0.00042	27	0.34
nrg/u233/sol/inter/001/case-23.inp	0.98936	0.00064	0.98754	0.00040	182	2.41
nrg/u233/sol/inter/001/case-24.inp	0.99190	0.00048	0.99677	0.00041	-487	-7.71
nrg/u233/sol/inter/001/case-25.inp	0.98482	0.00055	0.98703	0.00043	-221	-3.17
nrg/u233/sol/inter/001/case-26.inp	0.98920	0.00060	0.99055	0.00043	-135	-1.83
nrg/u233/sol/inter/001/case-27.inp	0.99170	0.00049	0.98748	0.00039	422	6.74
nrg/u233/sol/inter/001/case-28.inp	0.98342	0.00062	0.98401	0.00042	-59	-0.79
nrg/u233/sol/inter/001/case-29.inp	0.97766	0.00063	0.97684	0.00040	82	1.10
nrg/u233/sol/inter/001/case-3.inp	0.98220	0.00052	0.98252	0.00041	-32	-0.48
nrg/u233/sol/inter/001/case-30.inp	0.97980	0.00062	0.97768	0.00042	212	2.83
nrg/u233/sol/inter/001/case-31.inp	0.99152	0.00062	0.99108	0.00040	44	0.60

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/u233/sol/inter/001/case-32.inp	0.97646	0.00056	0.97582	0.00042	64	0.91
nrg/u233/sol/inter/001/case-33.inp	0.99402	0.00060	0.99009	0.00041	393	5.41
nrg/u233/sol/inter/001/case-4.inp	0.99267	0.00059	0.98956	0.00039	311	4.40
nrg/u233/sol/inter/001/case-5.inp	0.98498	0.00055	0.98495	0.00040	3	0.04
nrg/u233/sol/inter/001/case-6.inp	0.98697	0.00065	0.98341	0.00041	356	4.63
nrg/u233/sol/inter/001/case-7.inp	0.98228	0.00057	0.98280	0.00040	-52	-0.75
nrg/u233/sol/inter/001/case-8.inp	0.98155	0.00057	0.98151	0.00040	4	0.06
nrg/u233/sol/inter/001/case-9.inp	0.97929	0.00064	0.97387	0.00041	542	7.13
nrg/u233/sol/therm/001/case-1.inp	1.00153	0.00010	0.97881	0.00021	2272	97.68
nrg/u233/sol/therm/001/case-2.inp	1.00111	0.00013	0.97907	0.00019	2204	95.74
nrg/u233/sol/therm/001/case-3.inp	1.00107	0.00012	0.97986	0.00020	2121	90.94
nrg/u233/sol/therm/001/case-4.inp	1.00090	0.00012	0.98051	0.00020	2039	87.42
nrg/u233/sol/therm/001/case-5.inp	1.00032	0.00012	0.98079	0.00020	1953	83.73
nrg/u233/sol/therm/003/case-40.inp	1.00843	0.00063	1.02938	0.00042	-2095	-27.67
nrg/u233/sol/therm/008/inp.inp	1.00149	0.00005	0.99222	0.00012	927	71.31
nrg/u233/sol/therm/012/case-1.inp	1.00121	0.00068	1.00033	0.00043	88	1.09
nrg/u233/sol/therm/012/case-2.inp	1.00065	0.00056	1.00008	0.00041	57	0.82
nrg/u233/sol/therm/012/case-3.inp	1.01065	0.00046	1.00922	0.00043	143	2.27
nrg/u233/sol/therm/012/case-4.inp	1.00360	0.00063	1.00302	0.00041	58	0.77
nrg/u233/sol/therm/012/case-5.inp	1.00527	0.00054	1.00438	0.00041	89	1.31
nrg/u233/sol/therm/012/case-6.inp	1.00644	0.00060	1.00550	0.00039	94	1.31
nrg/u233/sol/therm/012/case-7.inp	1.00214	0.00045	1.00192	0.00034	22	0.39
nrg/u233/sol/therm/012/case-8.inp	0.99891	0.00043	0.99889	0.00036	2	0.04
nrg/u233/sol/therm/013/u13-1.inp	1.00428	0.00071	1.00472	0.00039	-44	-0.54
nrg/u233/sol/therm/013/u13-10.inp	1.00720	0.00053	1.00719	0.00039	1	0.02
nrg/u233/sol/therm/013/u13-11.inp	1.00443	0.00054	1.00419	0.00038	24	0.36
nrg/u233/sol/therm/013/u13-12.inp	1.00641	0.00060	1.00551	0.00038	90	1.27
nrg/u233/sol/therm/013/u13-13.inp	1.00397	0.00059	1.00360	0.00040	37	0.52
nrg/u233/sol/therm/013/u13-14.inp	1.00642	0.00059	1.00588	0.00039	54	0.76
nrg/u233/sol/therm/013/u13-15.inp	1.02152	0.00059	1.02132	0.00041	20	0.28
nrg/u233/sol/therm/013/u13-16.inp	0.99469	0.00052	0.99401	0.00038	68	1.06
nrg/u233/sol/therm/013/u13-17.inp	0.99696	0.00053	0.99551	0.00039	145	2.20
nrg/u233/sol/therm/013/u13-18.inp	1.00019	0.00057	1.00067	0.00038	-48	-0.70
nrg/u233/sol/therm/013/u13-19.inp	0.99615	0.00058	0.99524	0.00037	91	1.32
nrg/u233/sol/therm/013/u13-2.inp	1.00422	0.00059	1.00500	0.00040	-78	-1.09
nrg/u233/sol/therm/013/u13-20.inp	1.00002	0.00058	0.99955	0.00034	47	0.70
nrg/u233/sol/therm/013/u13-21.inp	1.00252	0.00048	1.00201	0.00033	51	0.88
nrg/u233/sol/therm/013/u13-3.inp	1.00522	0.00061	1.00518	0.00039	4	0.06
nrg/u233/sol/therm/013/u13-4.inp	1.00579	0.00056	1.00588	0.00040	-9	-0.13
nrg/u233/sol/therm/013/u13-5.inp	1.00746	0.00055	1.00705	0.00040	41	0.60
nrg/u233/sol/therm/013/u13-6.inp	1.00587	0.00058	1.00598	0.00040	-11	-0.16
nrg/u233/sol/therm/013/u13-7.inp	1.00578	0.00051	1.00608	0.00040	-30	-0.46
nrg/u233/sol/therm/013/u13-8.inp	1.00727	0.00061	1.00716	0.00040	11	0.15

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
nrg/u233/sol/therm/013/u13-9.inp	1.00764	0.00056	1.00728	0.00041	36	0.52

Table A.2. Comparison of IAEA MCNP results to Serpent-2 results

All calculations use ENDF/B-7.1

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/comp/inter/003/hci003-001.i	1.00489	0.00011	1.00665	0.00028	-176	-5.85
iaea/heu/comp/inter/003/hci003-002.i	1.00790	0.00014	1.00873	0.00030	-83	-2.51
iaea/heu/comp/inter/003/hci003-003.i	1.00258	0.00015	1.00401	0.00030	-143	-4.26
iaea/heu/comp/inter/003/hci003-004.i	1.00417	0.00014	1.00476	0.00030	-59	-1.78
iaea/heu/comp/inter/003/hci003-005.i	0.99742	0.00015	0.99779	0.00028	-37	-1.16
iaea/heu/comp/inter/003/hci003-006.i	0.99567	0.00015	0.99706	0.00030	-139	-4.14
iaea/heu/comp/inter/003/hci003-007.i	0.99712	0.00016	0.99833	0.00028	-121	-3.75
iaea/heu/met/fast/001/hmf001.i	0.99990	0.00008	0.99954	0.00029	36	1.20
iaea/heu/met/fast/002/hmf002-001.i	1.00145	0.00009	1.00163	0.00030	-18	-0.57
iaea/heu/met/fast/002/hmf002-002.i	1.00216	0.00007	1.00143	0.00030	73	2.37
iaea/heu/met/fast/002/hmf002-003.i	1.00034	0.00020	0.99984	0.00032	50	1.33
iaea/heu/met/fast/002/hmf002-004.i	0.99979	0.00018	0.99900	0.00032	79	2.15
iaea/heu/met/fast/002/hmf002-005.i	0.99982	0.00013	0.99966	0.00033	16	0.45
iaea/heu/met/fast/002/hmf002-006.i	1.00151	0.00017	1.00071	0.00031	80	2.26
iaea/heu/met/fast/003/hmf003-001.i	0.99496	0.00007	0.99566	0.00027	-70	-2.51
iaea/heu/met/fast/003/hmf003-002.i	0.99455	0.00007	0.99490	0.00028	-35	-1.21
iaea/heu/met/fast/003/hmf003-003.i	0.99926	0.00007	0.99925	0.00029	1	0.03
iaea/heu/met/fast/003/hmf003-004.i	0.99725	0.00026	0.99822	0.00029	-97	-2.49
iaea/heu/met/fast/003/hmf003-005.i	1.00149	0.00013	1.00144	0.00031	5	0.15
iaea/heu/met/fast/003/hmf003-006.i	1.00160	0.00013	1.00151	0.00032	9	0.26
iaea/heu/met/fast/003/hmf003-007.i	1.00196	0.00013	1.00193	0.00032	3	0.09
iaea/heu/met/fast/003/hmf003-008.i	1.00140	0.00008	1.00095	0.00028	45	1.55
iaea/heu/met/fast/003/hmf003-009.i	1.00176	0.00008	1.00122	0.00028	54	1.85
iaea/heu/met/fast/003/hmf003-010.i	1.00499	0.00008	1.00239	0.00029	260	8.64
iaea/heu/met/fast/003/hmf003-011.i	1.00884	0.00008	1.00580	0.00032	304	9.22
iaea/heu/met/fast/003/hmf003-012.i	1.00862	0.00008	1.00912	0.00029	-50	-1.66
iaea/heu/met/fast/004/hmf004.i	1.00351	0.00011	1.02375	0.00033	-2024	-58.19
iaea/heu/met/fast/007/hmf007-001.i	0.99293	0.00009	0.99326	0.00027	-33	-1.16
iaea/heu/met/fast/008/hmf008.i	0.99578	0.00011	0.99555	0.00028	23	0.76
iaea/heu/met/fast/009/hmf009-001.i	0.99768	0.00009	0.99766	0.00028	2	0.07
iaea/heu/met/fast/009/hmf009-002.i	0.99664	0.00009	0.99650	0.00027	14	0.49
iaea/heu/met/fast/010/hmf010-001.i	0.99857	0.00009	0.99880	0.00027	-23	-0.81
iaea/heu/met/fast/010/hmf010-002.i	0.99792	0.00009	0.99725	0.00028	67	2.28
iaea/heu/met/fast/011/hmf011.i	0.99879	0.00011	1.01732	0.00030	-1853	-57.99
iaea/heu/met/fast/012/hmf012.i	0.99822	0.00008	0.99846	0.00027	-24	-0.85
iaea/heu/met/fast/013/hmf013.i	0.99736	0.00011	0.99740	0.00026	-4	-0.14
iaea/heu/met/fast/014/hmf014.i	0.99788	0.00009	0.99857	0.00026	-69	-2.51
iaea/heu/met/fast/015/hmf015.i	0.99454	0.00009	0.99502	0.00027	-48	-1.69
iaea/heu/met/fast/016/hmf016-001.i	1.00160	0.00010	1.00205	0.00029	-45	-1.47
iaea/heu/met/fast/016/hmf016-002.i	1.00247	0.00009	1.00236	0.00029	11	0.36
iaea/heu/met/fast/017/hmf017.i	1.00063	0.00010	1.00032	0.00029	31	1.01
iaea/heu/met/fast/018/hmf018.i	0.99999	0.00009	1.00036	0.00027	-37	-1.30
iaea/heu/met/fast/019/hmf019.i	1.00697	0.00009	1.00532	0.00027	165	5.80
iaea/heu/met/fast/021/hmf021.i	0.99724	0.00017	0.99670	0.00028	54	1.65
iaea/heu/met/fast/022/hmf022.i	0.99748	0.00009	0.99769	0.00027	-21	-0.74
iaea/heu/met/fast/024/hmf024.i	0.99856	0.00011	1.00495	0.00031	-639	-19.43

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/met/fast/025/hmf025-001.i	0.99891	0.00008	0.99945	0.00028	-54	-1.85
iaea/heu/met/fast/025/hmf025-002.i	1.00130	0.00009	1.00092	0.00028	38	1.29
iaea/heu/met/fast/025/hmf025-003.i	1.00388	0.00009	1.00439	0.00027	-51	-1.79
iaea/heu/met/fast/025/hmf025-004.i	1.00525	0.00009	1.00576	0.00027	-51	-1.79
iaea/heu/met/fast/025/hmf025-005.i	1.00540	0.00008	1.00576	0.00027	-36	-1.28
iaea/heu/met/fast/027/hmf027.i	1.00092	0.00009	1.00117	0.00028	-25	-0.85
iaea/heu/met/fast/028/hmf028.i	1.00283	0.00004	1.00260	0.00031	23	0.74
iaea/heu/met/fast/029/hmf029.i	1.00552	0.00009	1.00637	0.00028	-85	-2.89
iaea/heu/met/fast/031/hmf031.i	1.00537	0.00011	1.00692	0.00035	-155	-4.22
iaea/heu/met/fast/032/hmf032-001.i	1.00423	0.00009	1.00621	0.00028	-198	-6.73
iaea/heu/met/fast/032/hmf032-002.i	1.00462	0.00007	1.00602	0.00028	-140	-4.85
iaea/heu/met/fast/032/hmf032-003.i	1.00024	0.00009	1.00073	0.00028	-49	-1.67
iaea/heu/met/fast/032/hmf032-004.i	1.00087	0.00006	1.00147	0.00027	-60	-2.17
iaea/heu/met/fast/038/hmf038-001.i	1.00301	0.00009	1.00381	0.00032	-80	-2.41
iaea/heu/met/fast/038/hmf038-002.i	1.00211	0.00010	1.00235	0.00032	-24	-0.72
iaea/heu/met/fast/040/hmf040.i	1.00469	0.00009	1.00438	0.00029	31	1.02
iaea/heu/met/fast/041/hmf041-001.i	1.00694	0.00010	1.00667	0.00027	27	0.94
iaea/heu/met/fast/041/hmf041-002.i	1.00519	0.00010	1.00569	0.00029	-50	-1.63
iaea/heu/met/fast/041/hmf041-003.i	1.00302	0.00009	0.99983	0.00027	319	11.21
iaea/heu/met/fast/041/hmf041-004.i	1.00788	0.00009	1.00322	0.00027	466	16.37
iaea/heu/met/fast/041/hmf041-006.i	1.00366	0.00009	1.00049	0.00027	317	11.14
iaea/heu/met/fast/041/hmf041-006.i	1.00512	0.00010	1.00049	0.00027	463	16.08
iaea/heu/met/fast/043/hmf043-001.i	0.99911	0.00009	0.99927	0.00028	-16	-0.54
iaea/heu/met/fast/043/hmf043-002.i	0.99822	0.00009	0.99847	0.00028	-25	-0.85
iaea/heu/met/fast/043/hmf043-003.i	0.99867	0.00009	0.99908	0.00028	-41	-1.39
iaea/heu/met/fast/043/hmf043-004.i	0.99749	0.00009	0.99716	0.00027	33	1.16
iaea/heu/met/fast/043/hmf043-005.i	0.99854	0.00009	0.99831	0.00028	23	0.78
iaea/heu/met/fast/044/hmf044-001.i	0.99989	0.00009	1.00005	0.00028	-16	-0.54
iaea/heu/met/fast/044/hmf044-002.i	0.99964	0.00009	0.99994	0.00027	-30	-1.05
iaea/heu/met/fast/044/hmf044-003.i	1.00003	0.00009	0.99973	0.00027	30	1.05
iaea/heu/met/fast/044/hmf044-004.i	0.99947	0.00009	0.99959	0.00028	-12	-0.41
iaea/heu/met/fast/044/hmf044-005.i	0.99981	0.00009	0.99954	0.00028	27	0.92
iaea/heu/met/fast/047/hmf047.i	1.00184	0.00010	1.00129	0.00029	55	1.79
iaea/heu/met/fast/048/hmf048-001.i	1.00334	0.00011	1.00452	0.00035	-118	-3.22
iaea/heu/met/fast/048/hmf048-002.i	1.00404	0.00011	1.00512	0.00035	-108	-2.94
iaea/heu/met/fast/048/hmf048-003.i	0.99359	0.00010	1.00508	0.00034	-1149	-32.42
iaea/heu/met/fast/048/hmf048-003.i	1.00188	0.00011	1.00508	0.00034	-320	-8.95
iaea/heu/met/fast/048/hmf048-004.i	1.00291	0.00011	1.00675	0.00033	-384	-11.04
iaea/heu/met/fast/048/hmf048-006.i	1.00168	0.00011	1.00332	0.00036	-164	-4.36
iaea/heu/met/fast/048/hmf048-007.i	1.00205	0.00011	1.00357	0.00035	-152	-4.14
iaea/heu/met/fast/048/hmf048-008.i	0.99981	0.00011	1.00207	0.00034	-226	-6.32
iaea/heu/met/fast/048/hmf048-009.i	0.99838	0.00011	1.00127	0.00034	-289	-8.09
iaea/heu/met/fast/048/hmf048-010.i	0.99695	0.00011	1.00051	0.00033	-356	-10.23
iaea/heu/met/fast/048/hmf048-011.i	1.00476	0.00011	1.00594	0.00035	-118	-3.22
iaea/heu/met/fast/048/hmf048-012.i	1.00130	0.00011	1.00296	0.00033	-166	-4.77
iaea/heu/met/fast/048/hmf048-013.i	1.00496	0.00011	1.00708	0.00033	-212	-6.09
iaea/heu/met/fast/048/hmf048-014.i	1.00046	0.00011	1.00214	0.00035	-168	-4.58
iaea/heu/met/fast/048/hmf048-015.i	0.99870	0.00011	0.99992	0.00035	-122	-3.33
iaea/heu/met/fast/048/hmf048-016.i	0.99351	0.00011	0.99501	0.00035	-150	-4.09
iaea/heu/met/fast/048/hmf048-017.i	0.99141	0.00011	0.99323	0.00035	-182	-4.96
iaea/heu/met/fast/049/hmf049-001.i	0.99791	0.00014	0.99814	0.00028	-23	-0.73
iaea/heu/met/fast/049/hmf049-002.i	0.99931	0.00014	1.00014	0.00028	-83	-2.65
iaea/heu/met/fast/049/hmf049-003.i	0.99846	0.00014	0.99875	0.00027	-29	-0.95
iaea/heu/met/fast/050/hmf050.i	0.99803	0.00015	0.99794	0.00027	9	0.29

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/met/fast/051/hmf051-001.i	0.99520	0.00009	0.99484	0.00028	36	1.22
iaea/heu/met/fast/051/hmf051-002.i	0.99540	0.00009	0.99463	0.00029	77	2.54
iaea/heu/met/fast/051/hmf051-003.i	0.99482	0.00009	0.99511	0.00027	-29	-1.02
iaea/heu/met/fast/051/hmf051-004.i	0.99500	0.00009	0.99530	0.00028	-30	-1.02
iaea/heu/met/fast/051/hmf051-009.i	0.99479	0.00009	0.99505	0.00026	-26	-0.94
iaea/heu/met/fast/051/hmf051-014.i	0.99890	0.00009	0.99896	0.00027	-6	-0.21
iaea/heu/met/fast/051/hmf051-015.i	0.99635	0.00009	0.99801	0.00028	-166	-5.64
iaea/heu/met/fast/051/hmf051-015.i	0.99805	0.00009	0.99801	0.00028	4	0.14
iaea/heu/met/fast/051/hmf051-017.i	0.99551	0.00009	0.99591	0.00027	-40	-1.41
iaea/heu/met/fast/051/hmf051-018.i	0.99419	0.00009	0.99402	0.00028	17	0.58
iaea/heu/met/fast/052/hmf052.i	1.00486	0.00017	1.00596	0.00035	-110	-2.83
iaea/heu/met/fast/056/hmf056.i	1.01362	0.00008	1.01451	0.00034	-89	-2.55
iaea/heu/met/fast/057/hmf057-001.i	0.98960	0.00009	0.99020	0.00027	-60	-2.11
iaea/heu/met/fast/057/hmf057-002.i	0.99825	0.00009	0.99817	0.00028	8	0.27
iaea/heu/met/fast/057/hmf057-003.i	1.01716	0.00009	1.01743	0.00027	-27	-0.95
iaea/heu/met/fast/057/hmf057-004.i	0.98797	0.00009	0.98793	0.00028	4	0.14
iaea/heu/met/fast/057/hmf057-005.i	1.02184	0.00010	1.02228	0.00028	-44	-1.48
iaea/heu/met/fast/057/hmf057-006.i	0.99679	0.00009	0.99683	0.00027	-4	-0.14
iaea/heu/met/fast/058/hmf058-001.i	1.00333	0.00011	1.00598	0.00031	-265	-8.06
iaea/heu/met/fast/058/hmf058-002.i	1.00496	0.00010	1.00547	0.00030	-51	-1.61
iaea/heu/met/fast/058/hmf058-003.i	1.00297	0.00010	1.00326	0.00029	-29	-0.95
iaea/heu/met/fast/058/hmf058-004.i	1.00202	0.00009	1.00252	0.00028	-50	-1.70
iaea/heu/met/fast/058/hmf058-005.i	1.00083	0.00009	1.00089	0.00029	-6	-0.20
iaea/heu/met/fast/059/hmf059-001s.i	0.99056	0.00009	0.99061	0.00027	-5	-0.18
iaea/heu/met/fast/059/hmf059-002s.i	0.99340	0.00009	0.99382	0.00028	-42	-1.43
iaea/heu/met/fast/061/hmf061.i	1.00430	0.00047	1.00116	0.00030	314	5.63
iaea/heu/met/fast/062/hmf062.i	1.00197	0.00009	1.00172	0.00047	25	0.52
iaea/heu/met/fast/063/hmf063-001.i	1.00037	0.00009	1.00039	0.00028	-2	-0.07
iaea/heu/met/fast/063/hmf063-002.i	1.00078	0.00009	1.00103	0.00026	-25	-0.91
iaea/heu/met/fast/064/hmf064-001.i	0.99546	0.00009	0.99526	0.00027	20	0.70
iaea/heu/met/fast/065/hmf065.i	0.99793	0.00008	0.99834	0.00028	-41	-1.41
iaea/heu/met/fast/066/hmf066-001.i	1.00363	0.00010	1.00364	0.00030	-1	-0.03
iaea/heu/met/fast/066/hmf066-002.i	1.00154	0.00009	1.00251	0.00029	-97	-3.19
iaea/heu/met/fast/066/hmf066-003.i	1.00456	0.00009	1.00547	0.00028	-91	-3.09
iaea/heu/met/fast/066/hmf066-004.i	1.00502	0.00011	1.00609	0.00030	-107	-3.35
iaea/heu/met/fast/066/hmf066-005.i	1.00431	0.00010	1.00439	0.00028	-8	-0.27
iaea/heu/met/fast/066/hmf066-006.i	1.00357	0.00010	1.00342	0.00029	15	0.49
iaea/heu/met/fast/066/hmf066-007.i	1.00559	0.00010	1.00644	0.00029	-85	-2.77
iaea/heu/met/fast/066/hmf066-008.i	1.00436	0.00011	1.00551	0.00030	-115	-3.60
iaea/heu/met/fast/066/hmf066-009.i	1.00287	0.00011	1.00344	0.00030	-57	-1.78
iaea/heu/met/fast/069/hmf069s.i	0.99881	0.00009	0.99855	0.00027	26	0.91
iaea/heu/met/fast/071/hmf071-001.i	1.00064	0.00007	0.99745	0.00028	319	11.05
iaea/heu/met/fast/071/hmf071-002.i	1.00078	0.00008	0.99648	0.00028	430	14.77
iaea/heu/met/fast/071/hmf071-003.i	1.00136	0.00008	0.99791	0.00027	345	12.25
iaea/heu/met/fast/071/hmf071-004.i	1.00027	0.00007	0.99739	0.00027	288	10.33
iaea/heu/met/fast/071/hmf071-005.i	1.00010	0.00007	0.99725	0.00026	285	10.58
iaea/heu/met/fast/071/hmf071-006.i	1.00013	0.00007	0.99779	0.00028	234	8.11
iaea/heu/met/fast/071/hmf071-007.i	0.99874	0.00007	0.99621	0.00027	253	9.07
iaea/heu/met/fast/071/hmf071-008.i	1.00261	0.00007	0.99822	0.00027	439	15.74
iaea/heu/met/fast/071/hmf071-009.i	1.00212	0.00007	0.99796	0.00028	416	14.41
iaea/heu/met/fast/071/hmf071-010.i	1.00090	0.00007	0.99814	0.00027	276	9.90
iaea/heu/met/fast/071/hmf071-011.i	1.00073	0.00007	0.99876	0.00028	197	6.83
iaea/heu/met/fast/071/hmf071-012.i	1.00057	0.00007	0.99595	0.00028	462	16.01
iaea/heu/met/fast/071/hmf071-013.i	1.00098	0.00008	0.99681	0.00027	417	14.81

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/met/fast/071/hmf071-014.i	0.99827	0.00008	0.99476	0.00028	351	12.05
iaea/heu/met/fast/071/hmf071-015.i	0.99811	0.00007	0.99455	0.00026	356	13.22
iaea/heu/met/fast/071/hmf071-016.i	1.00027	0.00008	0.99692	0.00026	335	12.31
iaea/heu/met/fast/071/hmf071-017.i	0.99922	0.00008	0.99479	0.00028	443	15.21
iaea/heu/met/fast/071/hmf071-018.i	1.00102	0.00007	0.99694	0.00028	408	14.14
iaea/heu/met/fast/071/hmf071-019.i	0.99940	0.00007	0.99639	0.00027	301	10.79
iaea/heu/met/fast/071/hmf071-020.i	0.99845	0.00007	0.99545	0.00026	300	11.14
iaea/heu/met/fast/071/hmf071-021.i	1.00219	0.00007	0.99832	0.00027	387	13.87
iaea/heu/met/fast/071/hmf071-022.i	1.00137	0.00007	0.99735	0.00027	402	14.41
iaea/heu/met/fast/071/hmf071-023.i	0.99926	0.00007	0.99582	0.00027	344	12.33
iaea/heu/met/fast/071/hmf071-024.i	0.99898	0.00007	0.99581	0.00027	317	11.37
iaea/heu/met/fast/071/hmf071-025.i	0.99708	0.00007	0.99450	0.00027	258	9.25
iaea/heu/met/fast/071/hmf071-026.i	1.00220	0.00008	0.99832	0.00029	388	12.90
iaea/heu/met/fast/071/hmf071-027.i	1.00159	0.00007	0.99742	0.00028	417	14.45
iaea/heu/met/fast/072/hmf072-001.i	1.00841	0.00009	1.00907	0.00028	-66	-2.24
iaea/heu/met/fast/072/hmf072-003.i	1.01220	0.00010	1.01289	0.00027	-69	-2.40
iaea/heu/met/fast/075/hmf075.i	1.00435	0.00014	1.00371	0.00029	64	1.99
iaea/heu/met/fast/076/hmf076-001d.i	0.99761	0.00009	1.00244	0.00028	-483	-16.42
iaea/heu/met/fast/076/hmf076-001s.i	0.99696	0.00009	1.00208	0.00028	-512	-17.41
iaea/heu/met/fast/076/hmf076-002d.i	0.99876	0.00010	1.00912	0.00028	-1036	-34.84
iaea/heu/met/fast/076/hmf076-002s.i	0.99724	0.00010	1.00743	0.00028	-1019	-34.27
iaea/heu/met/fast/076/hmf076-003d.i	0.99909	0.00009	1.01012	0.00027	-1103	-38.76
iaea/heu/met/fast/076/hmf076-003s.i	0.99962	0.00010	1.01071	0.00029	-1109	-36.15
iaea/heu/met/fast/076/hmf076-004d.i	0.99905	0.00011	1.05565	0.00032	-5660	-167.27
iaea/heu/met/fast/076/hmf076-004s.i	0.99928	0.00012	1.05566	0.00033	-5638	-160.56
iaea/heu/met/fast/076/hmf076-005d.i	1.00125	0.00012	1.05233	0.00033	-5108	-145.47
iaea/heu/met/fast/076/hmf076-005s.i	1.00178	0.00012	1.05311	0.00033	-5133	-146.18
iaea/heu/met/fast/076/hmf076-006d.i	1.00119	0.00011	1.04681	0.00032	-4562	-134.82
iaea/heu/met/fast/076/hmf076-006s.i	1.00120	0.00012	1.04707	0.00033	-4587	-130.63
iaea/heu/met/fast/076/hmf076-007d.i	0.99702	0.00011	1.03599	0.00034	-3897	-109.05
iaea/heu/met/fast/076/hmf076-007s.i	0.99813	0.00011	1.03747	0.00034	-3934	-110.09
iaea/heu/met/fast/076/hmf076-008d.i	0.99961	0.00011	1.03187	0.00034	-3226	-90.28
iaea/heu/met/fast/076/hmf076-008s.i	1.00004	0.00011	1.03246	0.00034	-3242	-90.72
iaea/heu/met/fast/076/hmf076-009d.i	1.00040	0.00011	1.04476	0.00031	-4436	-134.86
iaea/heu/met/fast/076/hmf076-009s.i	1.00069	0.00011	1.04604	0.00032	-4535	-134.02
iaea/heu/met/fast/076/hmf076-010d.i	1.00005	0.00011	1.04795	0.00031	-4790	-145.62
iaea/heu/met/fast/076/hmf076-010s.i	1.00093	0.00011	1.04937	0.00032	-4844	-143.15
iaea/heu/met/fast/076/hmf076-011d.i	0.99817	0.00011	1.03873	0.00031	-4056	-123.31
iaea/heu/met/fast/076/hmf076-011s.i	0.99968	0.00011	1.03966	0.00032	-3998	-118.15
iaea/heu/met/fast/076/hmf076-012d.i	0.99923	0.00011	1.04392	0.00034	-4469	-125.06
iaea/heu/met/fast/076/hmf076-012s.i	1.00058	0.00011	1.04560	0.00031	-4502	-136.86
iaea/heu/met/fast/076/hmf076-013d.i	0.99841	0.00011	1.03686	0.00031	-3845	-116.89
iaea/heu/met/fast/076/hmf076-013s.i	1.00077	0.00011	1.03874	0.00033	-3797	-109.16
iaea/heu/met/fast/076/hmf076-014d.i	0.99916	0.00011	1.04413	0.00033	-4497	-129.28
iaea/heu/met/fast/076/hmf076-014s.i	1.00093	0.00020	1.04707	0.00032	-4614	-122.27
iaea/heu/met/fast/076/hmf076-015d.i	0.99935	0.00011	1.04000	0.00032	-4065	-120.13
iaea/heu/met/fast/076/hmf076-015s.i	1.00053	0.00011	1.04165	0.00032	-4112	-121.52
iaea/heu/met/fast/076/hmf076-016d.i	1.00016	0.00011	1.04700	0.00033	-4684	-134.66
iaea/heu/met/fast/076/hmf076-016s.i	1.00167	0.00012	1.04827	0.00033	-4660	-132.71
iaea/heu/met/fast/076/hmf076-017d.i	0.99793	0.00011	1.03699	0.00034	-3906	-109.30
iaea/heu/met/fast/076/hmf076-017s.i	1.00053	0.00011	1.04010	0.00033	-3957	-113.76
iaea/heu/met/fast/076/hmf076-018d.i	0.99867	0.00011	1.04511	0.00032	-4644	-137.24
iaea/heu/met/fast/076/hmf076-018s.i	1.00120	0.00011	1.04777	0.00032	-4657	-137.63
iaea/heu/met/fast/076/hmf076-019d.i	1.00085	0.00011	1.03979	0.00033	-3894	-111.94

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/met/fast/076/hmf076-019s.i	1.00173	0.00011	1.04097	0.00033	-3924	-112.81
iaea/heu/met/fast/076/hmf076-020s.i	0.99864	0.00011	1.04790	0.00034	-4926	-137.85
iaea/heu/met/fast/076/hmf076-020s.i	0.99921	0.00011	1.04790	0.00034	-4869	-136.25
iaea/heu/met/fast/077/hmf077-001.i	0.99718	0.00009	0.99652	0.00026	66	2.40
iaea/heu/met/fast/077/hmf077-002.i	0.99629	0.00009	0.99602	0.00028	27	0.92
iaea/heu/met/fast/077/hmf077-003.i	0.99900	0.00009	0.99785	0.00026	115	4.18
iaea/heu/met/fast/078/hmf078-001.i	0.99460	0.00010	0.99403	0.00030	57	1.80
iaea/heu/met/fast/078/hmf078-003.i	0.99590	0.00010	0.99594	0.00028	-4	-0.13
iaea/heu/met/fast/078/hmf078-005.i	0.99648	0.00010	0.99636	0.00029	12	0.39
iaea/heu/met/fast/078/hmf078-007.i	0.99880	0.00011	0.99905	0.00030	-25	-0.78
iaea/heu/met/fast/078/hmf078-009.i	0.99574	0.00010	0.99697	0.00030	-123	-3.89
iaea/heu/met/fast/078/hmf078-011.i	0.99587	0.00010	0.99727	0.00030	-140	-4.43
iaea/heu/met/fast/078/hmf078-013.i	0.99734	0.00011	0.99885	0.00029	-151	-4.87
iaea/heu/met/fast/078/hmf078-015.i	0.99670	0.00010	0.99751	0.00030	-81	-2.56
iaea/heu/met/fast/078/hmf078-017.i	0.99682	0.00010	0.99737	0.00029	-55	-1.79
iaea/heu/met/fast/078/hmf078-023.i	0.99827	0.00009	0.99744	0.00027	83	2.92
iaea/heu/met/fast/078/hmf078-025.i	0.99766	0.00009	0.99631	0.00027	135	4.74
iaea/heu/met/fast/078/hmf078-027.i	0.99610	0.00009	0.99392	0.00029	218	7.18
iaea/heu/met/fast/078/hmf078-029.i	1.00312	0.00011	0.99745	0.00029	567	18.28
iaea/heu/met/fast/078/hmf078-031.i	0.99542	0.00009	0.99291	0.00027	251	8.82
iaea/heu/met/fast/078/hmf078-033.i	0.99701	0.00010	0.99106	0.00027	595	20.67
iaea/heu/met/fast/078/hmf078-035.i	0.99492	0.00009	0.99281	0.00027	211	7.41
iaea/heu/met/fast/078/hmf078-037.i	0.99663	0.00009	0.99453	0.00029	210	6.92
iaea/heu/met/fast/078/hmf078-039.i	0.99710	0.00010	0.99565	0.00028	145	4.88
iaea/heu/met/fast/078/hmf078-041.i	0.99671	0.00009	0.99679	0.00028	-8	-0.27
iaea/heu/met/fast/078/hmf078-043.i	0.99770	0.00009	0.99673	0.00030	97	3.10
iaea/heu/met/fast/079/hmf079-001.i	0.99979	0.00009	1.00017	0.00027	-38	-1.34
iaea/heu/met/fast/079/hmf079-002.i	0.99924	0.00009	0.99923	0.00027	1	0.04
iaea/heu/met/fast/079/hmf079-003.i	1.00022	0.00008	1.00008	0.00028	14	0.48
iaea/heu/met/fast/079/hmf079-004.i	1.00100	0.00009	1.00068	0.00028	32	1.09
iaea/heu/met/fast/079/hmf079-005.i	0.99967	0.00009	1.00009	0.00027	-42	-1.48
iaea/heu/met/fast/080/hmf080.i	1.00952	0.00017	1.00987	0.00028	-35	-1.07
iaea/heu/met/fast/082/hmf082-001.i	0.99628	0.00010	0.99678	0.00030	-50	-1.58
iaea/heu/met/fast/082/hmf082-002.i	0.99601	0.00010	0.99644	0.00031	-43	-1.32
iaea/heu/met/fast/082/hmf082-003.i	0.99836	0.00010	0.99920	0.00030	-84	-2.66
iaea/heu/met/fast/084/hmf084-014.i	0.99986	0.00009	1.00026	0.00028	-40	-1.36
iaea/heu/met/fast/085/hmf085-001.i	0.99998	0.00009	1.00009	0.00027	-11	-0.39
iaea/heu/met/fast/085/hmf085-002.i	1.00425	0.00009	1.00445	0.00028	-20	-0.68
iaea/heu/met/fast/085/hmf085-003.i	0.99614	0.00009	0.99635	0.00027	-21	-0.74
iaea/heu/met/fast/085/hmf085-004.i	0.99990	0.00009	1.00069	0.00027	-79	-2.78
iaea/heu/met/fast/085/hmf085-005.i	1.00044	0.00009	1.00103	0.00028	-59	-2.01
iaea/heu/met/fast/085/hmf085-006.i	1.00604	0.00009	1.00652	0.00028	-48	-1.63
iaea/heu/met/fast/087/hmf087.i	0.99820	0.00009	0.99876	0.00028	-56	-1.90
iaea/heu/met/fast/088/hmf088-001.i	0.99714	0.00011	1.01482	0.00032	-1768	-52.25
iaea/heu/met/fast/088/hmf088-002.i	0.99673	0.00011	1.00118	0.00033	-445	-12.79
iaea/heu/met/fast/089/hmf089.i	1.00013	0.00009	1.00010	0.00028	3	0.10
iaea/heu/met/fast/090/hmf090-001.i	1.00596	0.00011	1.00758	0.00031	-162	-4.92
iaea/heu/met/fast/090/hmf090-002.i	1.00240	0.00012	1.00387	0.00032	-147	-4.30
iaea/heu/met/fast/091/hmf091.i	1.00006	0.00011	1.00111	0.00032	-105	-3.10
iaea/heu/met/fast/092/hmf092-001.i	1.00119	0.00009	1.00145	0.00028	-26	-0.88
iaea/heu/met/fast/092/hmf092-002.i	1.00278	0.00009	1.00319	0.00027	-41	-1.44
iaea/heu/met/fast/092/hmf092-003.i	1.00401	0.00009	1.00461	0.00029	-60	-1.98
iaea/heu/met/fast/092/hmf092-004.i	1.00327	0.00009	1.00408	0.00027	-81	-2.85
iaea/heu/met/fast/093/hmf093.i	1.00316	0.00009	1.00404	0.00028	-88	-2.99

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/met/fast/094/hmf094-001.i	1.00373	0.00010	1.00433	0.00031	-60	-1.84
iaea/heu/met/fast/094/hmf094-002.i	1.00385	0.00010	1.00541	0.00031	-156	-4.79
iaea/heu/met/fast/099/hmf099-001.i	0.99549	0.00003	0.99564	0.00026	-15	-0.57
iaea/heu/met/fast/099/hmf099-001.i	0.99582	0.00003	0.99564	0.00026	18	0.69
iaea/heu/met/inter/001/hmi001.i	1.00064	0.00014	1.00053	0.00027	11	0.36
iaea/heu/met/inter/006/hmi006-001.i	0.99284	0.00011	0.98912	0.00029	372	11.99
iaea/heu/met/inter/006/hmi006-002.i	0.99697	0.00011	0.99309	0.00029	388	12.51
iaea/heu/met/inter/006/hmi006-003.i	0.99942	0.00011	0.99574	0.00029	368	11.86
iaea/heu/met/inter/006/hmi006-004.i	1.00729	0.00010	1.00459	0.00029	270	8.80
iaea/heu/met/mixed/002/hmm002.i	1.00724	0.00012	1.06101	0.00031	-5377	-161.76
iaea/heu/met/mixed/003/hmm003.i	1.00770	0.00012	1.06306	0.00031	-5536	-166.54
iaea/heu/met/mixed/015/hmm015.i	0.99734	0.00012	0.99908	0.00032	-174	-5.09
iaea/heu/met/mixed/016/hmm016-001.i	1.00215	0.00012	1.00295	0.00033	-80	-2.28
iaea/heu/met/mixed/016/hmm016-002.i	1.00306	0.00012	1.00493	0.00031	-187	-5.63
iaea/heu/met/mixed/017/hmm017.i	0.99550	0.00020	1.02266	0.00033	-2716	-70.39
iaea/heu/met/mixed/020/hmm020-001.i	1.00438	0.00012	1.00633	0.00033	-195	-5.55
iaea/heu/met/mixed/020/hmm020-002.i	1.00282	0.00012	1.00592	0.00032	-310	-9.07
iaea/heu/met/therm/001/hmt001-001.i	1.00762	0.00013	1.03928	0.00030	-3166	-96.83
iaea/heu/met/therm/003/hmt003-001.i	1.00250	0.00015	1.00638	0.00037	-388	-9.72
iaea/heu/met/therm/003/hmt003-002.i	0.98303	0.00014	0.98730	0.00035	-427	-11.33
iaea/heu/met/therm/009/hmt009.i	1.00290	0.00011	1.00485	0.00031	-195	-5.93
iaea/heu/met/therm/010/hmt010-002s.i	1.00869	0.00012	1.01215	0.00032	-346	-10.12
iaea/heu/met/therm/012/hmt012-001s.i	1.00922	0.00013	1.01357	0.00033	-435	-12.26
iaea/heu/met/therm/014/hmt014-001s.i	1.00777	0.00013	1.01288	0.00033	-511	-14.41
iaea/heu/met/therm/015/hmt015.i	1.00809	0.00015	1.01145	0.00031	-336	-9.76
iaea/heu/met/therm/018/hmt018.i	1.00118	0.00011	1.00352	0.00033	-234	-6.73
iaea/heu/met/therm/031/hmt031-001s.i	1.00891	0.00012	1.01229	0.00031	-338	-10.17
iaea/heu/met/therm/033/hmt033d.i	1.00394	0.00002	1.00780	0.00032	-386	-12.04
iaea/heu/met/therm/034/hmt034d.i	1.00618	0.00016	1.01899	0.00031	-1281	-36.72
iaea/heu/sol/therm/002/hst002-001.i	1.00266	0.00017	1.00293	0.00040	-27	-0.62
iaea/heu/sol/therm/002/hst002-002.i	1.00564	0.00016	1.00544	0.00038	20	0.49
iaea/heu/sol/therm/002/hst002-003.i	0.99837	0.00018	0.99869	0.00041	-32	-0.71
iaea/heu/sol/therm/002/hst002-004.i	1.00315	0.00016	1.00342	0.00040	-27	-0.63
iaea/heu/sol/therm/002/hst002-005.i	1.00439	0.00017	1.00396	0.00041	43	0.97
iaea/heu/sol/therm/002/hst002-006.i	1.00698	0.00016	1.00726	0.00038	-28	-0.68
iaea/heu/sol/therm/002/hst002-007.i	1.00012	0.00017	1.00000	0.00042	12	0.26
iaea/heu/sol/therm/002/hst002-008.i	1.00445	0.00016	1.00462	0.00039	-17	-0.40
iaea/heu/sol/therm/002/hst002-009.i	1.00072	0.00014	0.99992	0.00036	80	2.07
iaea/heu/sol/therm/002/hst002-010.i	1.00217	0.00014	1.00210	0.00034	7	0.19
iaea/heu/sol/therm/002/hst002-011.i	1.00249	0.00016	1.00260	0.00039	-11	-0.26
iaea/heu/sol/therm/002/hst002-012.i	1.00625	0.00016	1.00571	0.00038	54	1.31
iaea/heu/sol/therm/002/hst002-013.i	0.99831	0.00017	0.99842	0.00040	-11	-0.25
iaea/heu/sol/therm/002/hst002-014.i	1.00596	0.00017	1.00660	0.00038	-64	-1.54
iaea/heu/sol/therm/003/hst003-001.i	1.00188	0.00013	1.00099	0.00035	89	2.38
iaea/heu/sol/therm/003/hst003-002.i	1.00240	0.00013	1.00163	0.00036	77	2.01
iaea/heu/sol/therm/003/hst003-003.i	0.99995	0.00014	0.99920	0.00042	75	1.69
iaea/heu/sol/therm/003/hst003-004.i	1.00261	0.00014	1.00217	0.00041	44	1.02
iaea/heu/sol/therm/003/hst003-006.i	0.99688	0.00015	0.99938	0.00042	-250	-5.61
iaea/heu/sol/therm/003/hst003-006.i	1.00014	0.00015	0.99938	0.00042	76	1.70
iaea/heu/sol/therm/003/hst003-007.i	1.00249	0.00013	1.00174	0.00036	75	1.96
iaea/heu/sol/therm/003/hst003-008.i	1.00200	0.00015	1.00090	0.00042	110	2.47
iaea/heu/sol/therm/003/hst003-009.i	1.00592	0.00014	1.00585	0.00041	7	0.16
iaea/heu/sol/therm/003/hst003-010.i	0.99748	0.00015	0.99684	0.00044	64	1.38
iaea/heu/sol/therm/003/hst003-011.i	1.00280	0.00015	1.00353	0.00041	-73	-1.67

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/sol/therm/003/hst003-012.i	1.00097	0.00013	1.00074	0.00036	23	0.60
iaea/heu/sol/therm/003/hst003-013.i	1.00225	0.00012	0.99999	0.00035	226	6.11
iaea/heu/sol/therm/003/hst003-014.i	1.00289	0.00013	1.00127	0.00036	162	4.23
iaea/heu/sol/therm/003/hst003-015.i	0.99524	0.00013	0.99346	0.00037	178	4.54
iaea/heu/sol/therm/003/hst003-016.i	0.99967	0.00014	0.99863	0.00041	104	2.40
iaea/heu/sol/therm/003/hst003-017.i	1.00593	0.00014	1.00561	0.00038	32	0.79
iaea/heu/sol/therm/003/hst003-018.i	0.99646	0.00015	0.99608	0.00041	38	0.87
iaea/heu/sol/therm/003/hst003-019.i	1.00489	0.00014	1.00646	0.00040	-157	-3.70
iaea/heu/sol/therm/004/hst004-001.i	0.98605	0.00013	0.97989	0.00031	616	18.32
iaea/heu/sol/therm/004/hst004-002.i	0.98140	0.00013	0.97683	0.00033	457	12.88
iaea/heu/sol/therm/004/hst004-003.i	0.98803	0.00013	0.98459	0.00033	344	9.70
iaea/heu/sol/therm/004/hst004-004.i	0.99092	0.00013	0.98870	0.00035	222	5.95
iaea/heu/sol/therm/004/hst004-005.i	0.98937	0.00013	0.98803	0.00035	134	3.59
iaea/heu/sol/therm/004/hst004-006.i	0.98630	0.00014	0.98503	0.00036	127	3.29
iaea/heu/sol/therm/006/hst006-001.i	0.98214	0.00015	0.98251	0.00037	-37	-0.93
iaea/heu/sol/therm/006/hst006-002.i	0.98646	0.00014	0.98682	0.00030	-36	-1.09
iaea/heu/sol/therm/006/hst006-003.i	0.99843	0.00013	0.99865	0.00024	-22	-0.81
iaea/heu/sol/therm/006/hst006-004.i	1.00048	0.00012	1.00047	0.00021	1	0.04
iaea/heu/sol/therm/006/hst006-005.i	1.00804	0.00012	1.00777	0.00018	27	1.25
iaea/heu/sol/therm/006/hst006-006.i	0.99920	0.00011	0.99953	0.00016	-33	-1.70
iaea/heu/sol/therm/006/hst006-007.i	1.00087	0.00011	1.00093	0.00016	-6	-0.31
iaea/heu/sol/therm/006/hst006-008.i	0.98161	0.00014	0.98121	0.00038	40	0.99
iaea/heu/sol/therm/006/hst006-009.i	0.98650	0.00014	0.98653	0.00029	-3	-0.09
iaea/heu/sol/therm/006/hst006-010.i	0.99805	0.00012	0.99825	0.00025	-20	-0.72
iaea/heu/sol/therm/006/hst006-011.i	1.00084	0.00011	1.00145	0.00017	-61	-3.01
iaea/heu/sol/therm/006/hst006-012.i	0.98096	0.00014	0.98156	0.00038	-60	-1.48
iaea/heu/sol/therm/006/hst006-013.i	0.98449	0.00013	0.98479	0.00029	-30	-0.94
iaea/heu/sol/therm/006/hst006-014.i	0.99929	0.00013	0.99957	0.00022	-28	-1.10
iaea/heu/sol/therm/006/hst006-015.i	1.00694	0.00012	1.00692	0.00018	2	0.09
iaea/heu/sol/therm/006/hst006-016.i	0.99893	0.00011	0.99900	0.00016	-7	-0.36
iaea/heu/sol/therm/006/hst006-017.i	1.00064	0.00011	1.00124	0.00016	-60	-3.09
iaea/heu/sol/therm/006/hst006-018.i	1.00017	0.00012	1.00019	0.00022	-2	-0.08
iaea/heu/sol/therm/006/hst006-019.i	1.00735	0.00012	1.00765	0.00020	-30	-1.29
iaea/heu/sol/therm/006/hst006-020.i	0.99905	0.00011	0.99936	0.00018	-31	-1.47
iaea/heu/sol/therm/006/hst006-021.i	1.00106	0.00011	1.00149	0.00017	-43	-2.12
iaea/heu/sol/therm/006/hst006-022.i	0.99845	0.00013	0.99868	0.00026	-23	-0.79
iaea/heu/sol/therm/006/hst006-023.i	1.00055	0.00012	1.00093	0.00023	-38	-1.46
iaea/heu/sol/therm/006/hst006-024.i	1.00782	0.00012	1.00807	0.00020	-25	-1.07
iaea/heu/sol/therm/006/hst006-025.i	0.99937	0.00011	1.00010	0.00018	-73	-3.46
iaea/heu/sol/therm/006/hst006-026.i	1.00109	0.00011	1.00194	0.00017	-85	-4.20
iaea/heu/sol/therm/006/hst006-027.i	0.98289	0.00014	0.98356	0.00039	-67	-1.62
iaea/heu/sol/therm/006/hst006-028.i	0.98529	0.00013	0.98574	0.00033	-45	-1.27
iaea/heu/sol/therm/006/hst006-029.i	1.00146	0.00011	1.00144	0.00017	2	0.10
iaea/heu/sol/therm/010/hst010-001.i	1.00142	0.00013	1.00111	0.00036	31	0.81
iaea/heu/sol/therm/011/hst011-001.i	1.00460	0.00014	1.00514	0.00031	-54	-1.59
iaea/heu/sol/therm/011/hst011-002.i	1.00093	0.00015	1.00038	0.00034	55	1.48
iaea/heu/sol/therm/012/hst012.i	1.00107	0.00010	1.00087	0.00022	20	0.83
iaea/heu/sol/therm/014/hst014-001.i	0.99615	0.00015	0.99571	0.00033	44	1.21
iaea/heu/sol/therm/014/hst014-002.i	1.01198	0.00014	1.01168	0.00029	30	0.93
iaea/heu/sol/therm/014/hst014-003.i	1.02030	0.00013	1.01973	0.00024	57	2.09
iaea/heu/sol/therm/015/hst015-001.i	0.99885	0.00016	0.99853	0.00034	32	0.85
iaea/heu/sol/therm/015/hst015-002.i	0.99130	0.00016	0.99126	0.00036	4	0.10
iaea/heu/sol/therm/015/hst015-003.i	1.00800	0.00016	1.00826	0.00028	-26	-0.81
iaea/heu/sol/therm/015/hst015-004.i	1.01427	0.00015	1.01470	0.00029	-43	-1.32

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/sol/therm/015/hst015-005.i	1.01011	0.00013	1.00976	0.00023	35	1.32
iaea/heu/sol/therm/016/hst016-001.i	0.99213	0.00017	0.99225	0.00035	-12	-0.31
iaea/heu/sol/therm/016/hst016-002.i	1.00752	0.00016	1.00696	0.00030	56	1.65
iaea/heu/sol/therm/016/hst016-003.i	1.02501	0.00015	1.02500	0.00026	1	0.03
iaea/heu/sol/therm/017/hst017-001.i	0.99295	0.00016	0.99359	0.00038	-64	-1.55
iaea/heu/sol/therm/017/hst017-002.i	0.98141	0.00017	0.98121	0.00037	20	0.49
iaea/heu/sol/therm/017/hst017-003.i	0.98179	0.00017	0.98170	0.00036	9	0.23
iaea/heu/sol/therm/017/hst017-004.i	0.99762	0.00016	0.99759	0.00033	3	0.08
iaea/heu/sol/therm/017/hst017-005.i	1.00699	0.00016	1.00661	0.00030	38	1.12
iaea/heu/sol/therm/017/hst017-006.i	1.00058	0.00017	1.00054	0.00029	4	0.12
iaea/heu/sol/therm/017/hst017-007.i	1.00470	0.00016	1.00433	0.00031	37	1.06
iaea/heu/sol/therm/017/hst017-008.i	0.99926	0.00015	0.99887	0.00026	39	1.30
iaea/heu/sol/therm/018/hst018-001.i	0.99132	0.00017	0.99110	0.00039	22	0.52
iaea/heu/sol/therm/018/hst018-002.i	0.98826	0.00018	0.98778	0.00037	48	1.17
iaea/heu/sol/therm/018/hst018-003.i	0.98973	0.00016	0.98972	0.00036	1	0.03
iaea/heu/sol/therm/018/hst018-004.i	0.99778	0.00016	0.99802	0.00034	-24	-0.64
iaea/heu/sol/therm/018/hst018-005.i	0.99020	0.00017	0.98987	0.00034	33	0.87
iaea/heu/sol/therm/018/hst018-006.i	0.98994	0.00016	0.98975	0.00033	19	0.52
iaea/heu/sol/therm/018/hst018-007.i	1.00633	0.00015	1.00622	0.00029	11	0.34
iaea/heu/sol/therm/018/hst018-008.i	1.00590	0.00016	1.00587	0.00029	3	0.09
iaea/heu/sol/therm/018/hst018-009.i	1.00333	0.00016	1.00340	0.00029	-7	-0.21
iaea/heu/sol/therm/018/hst018-010.i	1.01840	0.00016	1.01849	0.00026	-9	-0.29
iaea/heu/sol/therm/018/hst018-011.i	1.02076	0.00014	1.02016	0.00026	60	2.03
iaea/heu/sol/therm/018/hst018-012.i	1.01410	0.00014	1.01346	0.00023	64	2.38
iaea/heu/sol/therm/019/hst019-001.i	0.99731	0.00014	0.99717	0.00038	14	0.35
iaea/heu/sol/therm/019/hst019-002.i	0.99923	0.00013	0.99887	0.00033	36	1.01
iaea/heu/sol/therm/019/hst019-003.i	0.99479	0.00013	0.99400	0.00031	79	2.35
iaea/heu/sol/therm/020/hst020-001.i	0.99052	0.00015	0.99566	0.00037	-514	-12.87
iaea/heu/sol/therm/020/hst020-002.i	0.99601	0.00016	1.00031	0.00038	-430	-10.43
iaea/heu/sol/therm/020/hst020-003.i	1.00513	0.00016	1.00355	0.00040	158	3.67
iaea/heu/sol/therm/020/hst020-004.i	1.00491	0.00017	1.00299	0.00039	192	4.51
iaea/heu/sol/therm/020/hst020-005.i	1.01446	0.00016	0.99720	0.00037	1726	42.82
iaea/heu/sol/therm/022/hst022.i	0.99535	0.00017	0.99544	0.00037	-9	-0.22
iaea/heu/sol/therm/023/hst023.i	0.99169	0.00018	0.99178	0.00037	-9	-0.22
iaea/heu/sol/therm/024/hst024-001.i	0.99157	0.00019	0.98930	0.00037	227	5.46
iaea/heu/sol/therm/024/hst024-003.i	0.98153	0.00020	0.98911	0.00036	-758	-18.41
iaea/heu/sol/therm/024/hst024-003.i	0.99198	0.00019	0.98911	0.00036	287	7.05
iaea/heu/sol/therm/024/hst024-004.i	0.99374	0.00018	0.99160	0.00035	214	5.44
iaea/heu/sol/therm/024/hst024-007.i	0.98688	0.00017	0.98471	0.00033	217	5.85
iaea/heu/sol/therm/024/hst024-008.i	0.99342	0.00017	0.99128	0.00033	214	5.76
iaea/heu/sol/therm/024/hst024-009.i	0.99133	0.00016	0.99191	0.00036	-58	-1.47
iaea/heu/sol/therm/024/hst024-010.i	0.99286	0.00016	0.99226	0.00037	60	1.49
iaea/heu/sol/therm/024/hst024-011.i	0.99797	0.00015	0.99723	0.00033	74	2.04
iaea/heu/sol/therm/025/hst025-001.i	1.00093	0.00012	1.00012	0.00031	81	2.44
iaea/heu/sol/therm/025/hst025-002.i	1.00028	0.00012	1.00062	0.00030	-34	-1.05
iaea/heu/sol/therm/025/hst025-003.i	0.99520	0.00011	0.99524	0.00024	-4	-0.15
iaea/heu/sol/therm/025/hst025-004.i	1.00073	0.00011	1.00103	0.00030	-30	-0.94
iaea/heu/sol/therm/025/hst025-005.i	1.00309	0.00013	1.00287	0.00033	22	0.62
iaea/heu/sol/therm/025/hst025-006.i	1.00841	0.00010	1.00789	0.00024	52	2.00
iaea/heu/sol/therm/025/hst025-007.i	1.01260	0.00010	1.01264	0.00024	-4	-0.15
iaea/heu/sol/therm/025/hst025-008.i	1.00984	0.00011	1.00984	0.00022	0	0.00
iaea/heu/sol/therm/025/hst025-009.i	1.00382	0.00011	1.00362	0.00026	20	0.71
iaea/heu/sol/therm/025/hst025-010.i	1.00802	0.00011	1.00777	0.00025	25	0.92
iaea/heu/sol/therm/025/hst025-011.i	1.00715	0.00011	1.00727	0.00025	-12	-0.44

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/sol/therm/025/hst025-012.i	1.00589	0.00011	1.00538	0.00024	51	1.93
iaea/heu/sol/therm/025/hst025-013.i	1.01386	0.00011	1.01360	0.00024	26	0.98
iaea/heu/sol/therm/025/hst025-014.i	1.00514	0.00010	1.00478	0.00026	36	1.29
iaea/heu/sol/therm/025/hst025-015.i	0.99904	0.00011	0.99841	0.00027	63	2.16
iaea/heu/sol/therm/025/hst025-016.i	1.00919	0.00011	1.00858	0.00026	61	2.16
iaea/heu/sol/therm/025/hst025-017.i	1.00107	0.00011	1.00069	0.00027	38	1.30
iaea/heu/sol/therm/025/hst025-018.i	0.99886	0.00011	0.99831	0.00026	55	1.95
iaea/heu/sol/therm/027/hst027-001.i	0.99591	0.00015	0.99634	0.00036	-43	-1.10
iaea/heu/sol/therm/027/hst027-002.i	0.99672	0.00015	0.99718	0.00035	-46	-1.21
iaea/heu/sol/therm/027/hst027-003.i	0.99756	0.00014	0.99831	0.00035	-75	-1.99
iaea/heu/sol/therm/027/hst027-004.i	0.99835	0.00014	0.99846	0.00036	-11	-0.28
iaea/heu/sol/therm/027/hst027-005.i	0.99649	0.00014	0.99643	0.00035	6	0.16
iaea/heu/sol/therm/027/hst027-006.i	0.99147	0.00015	0.99121	0.00035	26	0.68
iaea/heu/sol/therm/027/hst027-007.i	0.99792	0.00015	0.99812	0.00036	-20	-0.51
iaea/heu/sol/therm/027/hst027-008.i	1.00037	0.00014	0.99993	0.00035	44	1.17
iaea/heu/sol/therm/027/hst027-009.i	0.99782	0.00014	0.99741	0.00036	41	1.06
iaea/heu/sol/therm/028/hst028-001.i	0.99659	0.00013	0.99669	0.00035	-10	-0.27
iaea/heu/sol/therm/028/hst028-002.i	0.99699	0.00012	0.99642	0.00033	57	1.62
iaea/heu/sol/therm/028/hst028-003.i	0.99830	0.00012	0.99829	0.00036	1	0.03
iaea/heu/sol/therm/028/hst028-004.i	0.99857	0.00012	0.99936	0.00034	-79	-2.19
iaea/heu/sol/therm/028/hst028-005.i	0.99393	0.00013	0.99382	0.00036	11	0.29
iaea/heu/sol/therm/028/hst028-006.i	0.99734	0.00012	0.99728	0.00035	6	0.16
iaea/heu/sol/therm/028/hst028-007.i	0.99787	0.00012	0.99754	0.00036	33	0.87
iaea/heu/sol/therm/028/hst028-008.i	0.99762	0.00012	0.99744	0.00036	18	0.47
iaea/heu/sol/therm/028/hst028-009.i	0.99618	0.00013	0.99589	0.00041	29	0.67
iaea/heu/sol/therm/028/hst028-009.i	0.99677	0.00014	0.99589	0.00041	88	2.03
iaea/heu/sol/therm/028/hst028-010.i	0.99397	0.00013	0.99380	0.00039	17	0.41
iaea/heu/sol/therm/028/hst028-011.i	0.99749	0.00014	0.99770	0.00041	-21	-0.48
iaea/heu/sol/therm/028/hst028-012.i	0.99432	0.00013	0.99478	0.00040	-46	-1.09
iaea/heu/sol/therm/028/hst028-013.i	0.99629	0.00014	0.99639	0.00040	-10	-0.24
iaea/heu/sol/therm/028/hst028-014.i	0.99662	0.00013	0.99570	0.00040	92	2.19
iaea/heu/sol/therm/028/hst028-015.i	1.00446	0.00014	1.00371	0.00039	75	1.81
iaea/heu/sol/therm/028/hst028-016.i	1.00050	0.00014	1.00068	0.00039	-18	-0.43
iaea/heu/sol/therm/028/hst028-017.i	0.99585	0.00013	0.99609	0.00041	-24	-0.56
iaea/heu/sol/therm/029/hst029-001.i	0.99826	0.00014	0.99837	0.00039	-11	-0.27
iaea/heu/sol/therm/029/hst029-002.i	1.00219	0.00013	1.00176	0.00039	43	1.05
iaea/heu/sol/therm/029/hst029-003.i	0.99406	0.00013	0.99329	0.00039	77	1.87
iaea/heu/sol/therm/029/hst029-004.i	0.99285	0.00013	0.99304	0.00039	-19	-0.46
iaea/heu/sol/therm/029/hst029-005.i	0.99747	0.00014	0.99826	0.00037	-79	-2.00
iaea/heu/sol/therm/029/hst029-006.i	0.99786	0.00014	0.99800	0.00038	-14	-0.35
iaea/heu/sol/therm/029/hst029-007.i	0.99882	0.00014	0.99877	0.00040	5	0.12
iaea/heu/sol/therm/030/hst030-001.i	0.99662	0.00013	0.99725	0.00034	-63	-1.73
iaea/heu/sol/therm/030/hst030-002.i	0.99786	0.00012	0.99788	0.00034	-2	-0.06
iaea/heu/sol/therm/030/hst030-003.i	0.99596	0.00012	0.99630	0.00033	-34	-0.97
iaea/heu/sol/therm/030/hst030-004.i	1.00002	0.00014	0.99988	0.00037	14	0.35
iaea/heu/sol/therm/030/hst030-005.i	0.99604	0.00013	0.99636	0.00037	-32	-0.82
iaea/heu/sol/therm/030/hst030-006.i	0.99785	0.00013	0.99806	0.00040	-21	-0.50
iaea/heu/sol/therm/030/hst030-007.i	0.99705	0.00013	0.99745	0.00039	-40	-0.97
iaea/heu/sol/therm/033/hst033-001.i	0.99683	0.00015	0.99801	0.00037	-118	-2.96
iaea/heu/sol/therm/033/hst033-002.i	0.99561	0.00015	0.99589	0.00037	-28	-0.70
iaea/heu/sol/therm/033/hst033-003.i	0.99531	0.00014	0.99557	0.00035	-26	-0.69
iaea/heu/sol/therm/033/hst033-004.i	1.00399	0.00015	1.00528	0.00035	-129	-3.39
iaea/heu/sol/therm/033/hst033-005.i	1.00296	0.00014	1.00325	0.00037	-29	-0.73
iaea/heu/sol/therm/033/hst033-006.i	1.00790	0.00014	1.00873	0.00035	-83	-2.20

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/sol/therm/033/hst033-007.i	1.00362	0.00014	1.00516	0.00035	-154	-4.09
iaea/heu/sol/therm/033/hst033-008.i	1.00603	0.00015	1.00677	0.00035	-74	-1.94
iaea/heu/sol/therm/033/hst033-009.i	1.00875	0.00015	1.00968	0.00034	-93	-2.50
iaea/heu/sol/therm/033/hst033-010.i	1.00371	0.00015	1.00443	0.00037	-72	-1.80
iaea/heu/sol/therm/033/hst033-011.i	1.00555	0.00014	1.00656	0.00036	-101	-2.61
iaea/heu/sol/therm/033/hst033-012.i	1.00496	0.00015	1.00616	0.00037	-120	-3.01
iaea/heu/sol/therm/033/hst033-013.i	1.00024	0.00014	1.00061	0.00038	-37	-0.91
iaea/heu/sol/therm/033/hst033-014.i	1.00205	0.00014	1.00281	0.00036	-76	-1.97
iaea/heu/sol/therm/033/hst033-015.i	1.00240	0.00015	1.00316	0.00036	-76	-1.95
iaea/heu/sol/therm/033/hst033-016.i	1.00138	0.00015	1.00209	0.00036	-71	-1.82
iaea/heu/sol/therm/033/hst033-017.i	0.99821	0.00015	0.99872	0.00037	-51	-1.28
iaea/heu/sol/therm/033/hst033-018.i	0.99344	0.00014	0.99372	0.00038	-28	-0.69
iaea/heu/sol/therm/033/hst033-019.i	0.99249	0.00015	0.99271	0.00037	-22	-0.55
iaea/heu/sol/therm/033/hst033-020.i	1.00110	0.00014	1.00259	0.00037	-149	-3.77
iaea/heu/sol/therm/033/hst033-021.i	0.99964	0.00015	1.00061	0.00034	-97	-2.61
iaea/heu/sol/therm/033/hst033-022.i	0.99017	0.00014	0.99163	0.00036	-146	-3.78
iaea/heu/sol/therm/033/hst033-023.i	1.00259	0.00015	1.00344	0.00036	-85	-2.18
iaea/heu/sol/therm/033/hst033-024.i	0.99816	0.00015	0.99868	0.00035	-52	-1.37
iaea/heu/sol/therm/033/hst033-026.i	0.99834	0.00015	0.99871	0.00036	-37	-0.95
iaea/heu/sol/therm/033/hst033-026.i	1.00156	0.00016	0.99871	0.00036	285	7.23
iaea/heu/sol/therm/034/hst034-001.i	0.99288	0.00009	1.05646	0.00034	-6358	-180.77
iaea/heu/sol/therm/036/hst036-001.i	0.99340	0.00013	0.99295	0.00033	45	1.27
iaea/heu/sol/therm/037/hst037-001.i	1.00906	0.00011	1.00884	0.00027	22	0.75
iaea/heu/sol/therm/037/hst037-003.i	1.00679	0.00012	1.00616	0.00030	63	1.95
iaea/heu/sol/therm/037/hst037-006.i	1.01217	0.00012	1.01183	0.00032	34	0.99
iaea/heu/sol/therm/038/hst038-011.i	0.99654	0.00023	0.99637	0.00037	17	0.39
iaea/heu/sol/therm/043/hst043-001.i	0.99480	0.00014	0.99488	0.00037	-8	-0.20
iaea/heu/sol/therm/043/hst043-002.i	1.00538	0.00009	1.00492	0.00022	46	1.94
iaea/heu/sol/therm/043/hst043-003.i	1.00092	0.00008	1.00114	0.00018	-22	-1.12
iaea/heu/sol/therm/049/hst049-001.i	0.99900	0.00013	0.99869	0.00041	31	0.72
iaea/heu/sol/therm/049/hst049-002.i	0.99064	0.00015	0.99143	0.00040	-79	-1.85
iaea/heu/sol/therm/049/hst049-003.i	0.99808	0.00014	0.99822	0.00037	-14	-0.35
iaea/heu/sol/therm/049/hst049-004.i	0.99919	0.00013	0.99993	0.00034	-74	-2.03
iaea/heu/sol/therm/049/hst049-005.i	1.00139	0.00013	1.00135	0.00031	4	0.12
iaea/heu/sol/therm/049/hst049-006.i	1.00508	0.00013	1.00471	0.00031	37	1.10
iaea/heu/sol/therm/049/hst049-007.i	1.00551	0.00013	1.00566	0.00032	-15	-0.43
iaea/heu/sol/therm/049/hst049-008.i	1.00386	0.00013	1.00422	0.00030	-36	-1.10
iaea/heu/sol/therm/049/hst049-009.i	0.99857	0.00014	0.99839	0.00039	18	0.43
iaea/heu/sol/therm/049/hst049-010.i	0.98880	0.00015	0.98841	0.00039	39	0.93
iaea/heu/sol/therm/049/hst049-011.i	0.99272	0.00014	0.99246	0.00038	26	0.64
iaea/heu/sol/therm/049/hst049-012.i	0.99581	0.00014	0.99550	0.00036	31	0.80
iaea/heu/sol/therm/049/hst049-013.i	0.99646	0.00014	0.99669	0.00034	-23	-0.63
iaea/heu/sol/therm/049/hst049-014.i	0.99775	0.00014	0.99788	0.00033	-13	-0.36
iaea/heu/sol/therm/049/hst049-015.i	0.99992	0.00013	1.00029	0.00031	-37	-1.10
iaea/heu/sol/therm/049/hst049-016.i	0.99855	0.00013	0.99858	0.00033	-3	-0.08
iaea/heu/sol/therm/049/hst049-017.i	0.99847	0.00013	0.99818	0.00030	29	0.89
iaea/heu/sol/therm/049/hst049-018.i	1.00005	0.00013	0.99998	0.00029	7	0.22
iaea/heu/sol/therm/049/hst049-019.i	1.00085	0.00013	1.00083	0.00030	2	0.06
iaea/heu/sol/therm/049/hst049-020.i	0.99932	0.00012	0.99955	0.00027	-23	-0.78
iaea/heu/sol/therm/050/hst050-001.i	1.00675	0.00015	1.00728	0.00035	-53	-1.39
iaea/heu/sol/therm/050/hst050-002.i	1.00260	0.00015	1.00307	0.00038	-47	-1.15
iaea/heu/sol/therm/050/hst050-003.i	1.00436	0.00014	1.00500	0.00037	-64	-1.62
iaea/heu/sol/therm/050/hst050-004.i	1.00434	0.00015	1.00475	0.00037	-41	-1.03
iaea/heu/sol/therm/050/hst050-005.i	1.00067	0.00016	1.00105	0.00037	-38	-0.94

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/heu/sol/therm/050/hst050-006.i	1.00924	0.00015	1.00881	0.00036	43	1.10
iaea/heu/sol/therm/050/hst050-007.i	0.99811	0.00015	0.99711	0.00037	100	2.50
iaea/heu/sol/therm/050/hst050-008.i	0.99761	0.00015	0.99809	0.00037	-48	-1.20
iaea/heu/sol/therm/050/hst050-009.i	0.99711	0.00014	0.99705	0.00036	6	0.16
iaea/heu/sol/therm/050/hst050-010.i	0.97997	0.00015	0.98008	0.00036	-11	-0.28
iaea/heu/sol/therm/050/hst050-011.i	0.99106	0.00014	0.99058	0.00036	48	1.24
iaea/ieu/comp/fast/004/icf004.i	1.00009	0.00007	0.99696	0.00025	313	12.06
iaea/ieu/comp/inter/005/ici005.i	0.99283	0.00036	0.99065	0.00020	218	5.29
iaea/ieu/comp/therm/015/ict015-001.i	0.98179	0.00010	0.98127	0.00033	52	1.51
iaea/ieu/comp/therm/015/ict015-002.i	0.98650	0.00010	0.98596	0.00036	54	1.45
iaea/ieu/comp/therm/015/ict015-003.i	0.98844	0.00010	0.98866	0.00036	-22	-0.59
iaea/ieu/comp/therm/015/ict015-003.i	0.99561	0.00008	0.98866	0.00036	695	18.85
iaea/ieu/comp/therm/015/ict015-005.i	0.99471	0.00009	0.99692	0.00034	-221	-6.28
iaea/ieu/comp/therm/015/ict015-006.i	0.99250	0.00009	0.99433	0.00035	-183	-5.06
iaea/ieu/comp/therm/015/ict015-007.i	0.99418	0.00009	0.99654	0.00036	-236	-6.36
iaea/ieu/comp/therm/015/ict015-008.i	0.99819	0.00010	1.00085	0.00037	-266	-6.94
iaea/ieu/comp/therm/015/ict015-009.i	0.99761	0.00009	0.99975	0.00037	-214	-5.62
iaea/ieu/comp/therm/015/ict015-010.i	0.99814	0.00009	1.00164	0.00038	-350	-8.96
iaea/ieu/comp/therm/015/ict015-011.i	1.00094	0.00010	1.00425	0.00036	-331	-8.86
iaea/ieu/comp/therm/015/ict015-012.i	1.00131	0.00009	1.00356	0.00037	-225	-5.91
iaea/ieu/comp/therm/015/ict015-013.i	0.99978	0.00010	1.00223	0.00037	-245	-6.39
iaea/ieu/comp/therm/015/ict015-014.i	1.00001	0.00010	1.00337	0.00038	-336	-8.55
iaea/ieu/comp/therm/015/ict015-015.i	0.99917	0.00010	1.00236	0.00037	-319	-8.32
iaea/ieu/comp/therm/015/ict015-016.i	0.99478	0.00010	0.99765	0.00038	-287	-7.30
iaea/ieu/comp/therm/015/ict015-017.i	0.99584	0.00009	0.99831	0.00038	-247	-6.33
iaea/ieu/comp/therm/015/ict015-018.i	0.99196	0.00009	0.99412	0.00039	-216	-5.40
iaea/ieu/comp/therm/015/ict015-019.i	0.99718	0.00008	0.99879	0.00033	-161	-4.74
iaea/ieu/comp/therm/015/ict015-020.i	0.99994	0.00008	1.00114	0.00033	-120	-3.53
iaea/ieu/comp/therm/015/ict015-021.i	0.99501	0.00008	0.99688	0.00034	-187	-5.35
iaea/ieu/comp/therm/015/ict015-022.i	0.99500	0.00008	0.99681	0.00034	-181	-5.18
iaea/ieu/comp/therm/015/ict015-023.i	0.99501	0.00008	0.99655	0.00035	-154	-4.29
iaea/ieu/comp/therm/015/ict015-024.i	0.99409	0.00008	0.99606	0.00036	-197	-5.34
iaea/ieu/comp/therm/015/ict015-025.i	0.99933	0.00009	1.00185	0.00037	-252	-6.62
iaea/ieu/comp/therm/015/ict015-026.i	1.00074	0.00010	1.00272	0.00038	-198	-5.04
iaea/ieu/comp/therm/015/ict015-027.i	0.99220	0.00010	0.99431	0.00037	-211	-5.51
iaea/ieu/comp/therm/015/ict015-028.i	0.99929	0.00010	0.99937	0.00037	-8	-0.21
iaea/ieu/met/fast/001/imf001-001d.i	1.00026	0.00009	1.00040	0.00028	-14	-0.48
iaea/ieu/met/fast/001/imf001-002d.i	1.00050	0.00009	1.00052	0.00027	-2	-0.07
iaea/ieu/met/fast/001/imf001-004d.i	1.00152	0.00008	1.00260	0.00027	-108	-3.84
iaea/ieu/met/fast/002/imf002.i	0.99884	0.00008	0.99860	0.00022	24	1.03
iaea/ieu/met/fast/003/imf003-001d.i	1.00233	0.00009	1.00321	0.00026	-88	-3.20
iaea/ieu/met/fast/004/imf004-001d.i	1.00754	0.00009	1.00586	0.00025	168	6.32
iaea/ieu/met/fast/005/imf005.i	1.00182	0.00009	1.00181	0.00024	1	0.04
iaea/ieu/met/fast/006/imf006.i	0.99629	0.00009	0.99644	0.00026	-15	-0.55
iaea/ieu/met/fast/010/imf010.i	0.99538	0.00009	0.99026	0.00021	512	22.41
iaea/ieu/met/fast/012/imf012.i	1.00313	0.00007	1.00052	0.00024	261	10.44
iaea/ieu/met/fast/015/imf015.i	0.99907	0.00009	0.99774	0.00030	133	4.25
iaea/ieu/met/fast/016/imf016.i	0.99634	0.00008	0.99327	0.00025	307	11.70
iaea/ieu/met/fast/020/imf020-001s.i	1.00996	0.00011	1.00859	0.00027	137	4.70
iaea/ieu/met/fast/020/imf020-002s.i	1.01254	0.00010	1.01174	0.00024	80	3.08
iaea/ieu/met/fast/020/imf020-003s.i	1.01316	0.00010	1.01250	0.00022	66	2.73
iaea/ieu/met/fast/020/imf020-004s.i	1.01471	0.00010	1.01376	0.00022	95	3.93
iaea/ieu/met/fast/020/imf020-005s.i	1.01553	0.00010	1.01438	0.00022	115	4.76
iaea/ieu/met/fast/020/imf020-006s.i	1.01500	0.00010	1.01409	0.00023	91	3.63

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/ieu/met/fast/020/imf020-007s.i	1.01797	0.00011	1.01743	0.00022	54	2.20
iaea/ieu/met/fast/021/imf021-001s.i	1.01341	0.00006	1.01324	0.00024	17	0.69
iaea/ieu/met/fast/022/imf022-001.i	1.00766	0.00006	1.00561	0.00023	205	8.62
iaea/ieu/met/fast/022/imf022-002.i	0.99371	0.00007	0.99228	0.00024	143	5.72
iaea/ieu/met/fast/022/imf022-003.i	0.98215	0.00007	0.98087	0.00023	128	5.32
iaea/ieu/met/fast/022/imf022-004.i	0.98557	0.00007	0.98470	0.00023	87	3.62
iaea/ieu/met/fast/022/imf022-005.i	1.00108	0.00006	0.99957	0.00023	151	6.35
iaea/ieu/met/fast/022/imf022-006.i	1.00285	0.00006	1.00160	0.00023	125	5.26
iaea/ieu/met/fast/022/imf022-007.i	1.00190	0.00007	1.00112	0.00023	78	3.24
iaea/ieu/sol/therm/005/ist005.i	0.99927	0.00008	0.99934	0.00018	-7	-0.36
iaea/leu/sol/therm/001/lst001-001.i	1.01158	0.00015	1.01145	0.00027	13	0.42
iaea/leu/sol/therm/002/lst002-001.i	0.99989	0.00008	0.99973	0.00020	16	0.74
iaea/leu/sol/therm/002/lst002-002.i	0.99580	0.00009	0.99568	0.00021	12	0.53
iaea/leu/sol/therm/002/lst002-003.i	1.00068	0.00008	1.00042	0.00022	26	1.11
iaea/leu/sol/therm/003/lst003-001.i	0.99685	0.00009	0.99624	0.00023	61	2.47
iaea/leu/sol/therm/003/lst003-002.i	0.99560	0.00009	0.99509	0.00021	51	2.23
iaea/leu/sol/therm/003/lst003-003.i	0.99996	0.00009	0.99950	0.00020	46	2.10
iaea/leu/sol/therm/003/lst003-004.i	0.99358	0.00009	0.99341	0.00021	17	0.74
iaea/leu/sol/therm/003/lst003-005.i	0.99801	0.00007	0.99762	0.00017	39	2.12
iaea/leu/sol/therm/003/lst003-006.i	0.99835	0.00007	0.99818	0.00017	17	0.92
iaea/leu/sol/therm/003/lst003-007.i	0.99675	0.00007	0.99598	0.00015	77	4.65
iaea/leu/sol/therm/003/lst003-008.i	1.00025	0.00006	1.00015	0.00013	10	0.70
iaea/leu/sol/therm/003/lst003-009.i	0.99753	0.00006	0.99753	0.00013	0	0.00
iaea/leu/sol/therm/004/lst004-001.i	1.00057	0.00009	1.00014	0.00026	43	1.56
iaea/leu/sol/therm/004/lst004-002.i	1.00157	0.00009	1.00139	0.00024	18	0.70
iaea/leu/sol/therm/004/lst004-003.i	0.99985	0.00009	0.99923	0.00023	62	2.51
iaea/leu/sol/therm/004/lst004-004.i	1.00204	0.00008	1.00205	0.00022	-1	-0.04
iaea/leu/sol/therm/004/lst004-005.i	1.00195	0.00008	1.00193	0.00021	2	0.09
iaea/leu/sol/therm/004/lst004-006.i	1.00115	0.00008	1.00087	0.00021	28	1.25
iaea/leu/sol/therm/004/lst004-007.i	1.00121	0.00008	1.00114	0.00020	7	0.32
iaea/leu/sol/therm/007/lst007-001.i	0.99479	0.00010	0.99513	0.00023	-34	-1.36
iaea/leu/sol/therm/007/lst007-002.i	0.99719	0.00010	0.99703	0.00022	16	0.66
iaea/leu/sol/therm/007/lst007-003.i	0.99632	0.00009	0.99602	0.00020	30	1.37
iaea/leu/sol/therm/007/lst007-004.i	0.99889	0.00009	0.99850	0.00021	39	1.71
iaea/leu/sol/therm/007/lst007-005.i	0.99729	0.00008	0.99755	0.00018	-26	-1.32
iaea/leu/sol/therm/010/lst010-083.i	0.99777	0.00012	0.99743	0.00019	34	1.51
iaea/leu/sol/therm/010/lst010-085.i	1.00128	0.00012	1.00029	0.00020	99	4.24
iaea/leu/sol/therm/010/lst010-086.i	1.00144	0.00012	1.00099	0.00021	45	1.86
iaea/leu/sol/therm/010/lst010-088.i	1.00178	0.00012	1.00152	0.00021	26	1.07
iaea/leu/sol/therm/011/lst011-001.i	1.00357	0.00009	1.00310	0.00023	47	1.90
iaea/leu/sol/therm/011/lst011-002.i	1.00408	0.00008	1.00432	0.00021	-24	-1.07
iaea/leu/sol/therm/011/lst011-003.i	1.00331	0.00008	1.00319	0.00019	12	0.58
iaea/leu/sol/therm/011/lst011-004.i	1.00284	0.00008	1.00290	0.00019	-6	-0.29
iaea/leu/sol/therm/011/lst011-005.i	1.00217	0.00007	1.00197	0.00018	20	1.04
iaea/leu/sol/therm/011/lst011-006.i	1.00333	0.00007	1.00330	0.00018	3	0.16
iaea/leu/sol/therm/011/lst011-007.i	1.00348	0.00007	1.00327	0.00018	21	1.09
iaea/leu/sol/therm/011/lst011-008.i	1.00013	0.00009	0.99991	0.00019	22	1.05
iaea/leu/sol/therm/011/lst011-009.i	1.00104	0.00009	1.00109	0.00020	-5	-0.23
iaea/leu/sol/therm/011/lst011-010.i	1.00040	0.00008	1.00073	0.00018	-33	-1.68
iaea/leu/sol/therm/011/lst011-011.i	1.00041	0.00008	1.00026	0.00018	15	0.76
iaea/leu/sol/therm/011/lst011-012.i	1.00028	0.00007	0.99985	0.00017	43	2.34
iaea/leu/sol/therm/011/lst011-013.i	1.00133	0.00008	1.00129	0.00016	4	0.22
iaea/leu/sol/therm/012/lst012-001.i	1.00717	0.00006	1.00701	0.00025	16	0.62
iaea/leu/sol/therm/012/lst012-002.i	1.03049	0.00006	1.03052	0.00024	-3	-0.12

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/leu/sol/therm/016/lst016-001.i	1.00492	0.00011	1.00499	0.00028	-7	-0.23
iaea/leu/sol/therm/016/lst016-002.i	1.00479	0.00011	1.00446	0.00029	33	1.06
iaea/leu/sol/therm/016/lst016-003.i	1.00412	0.00010	1.00475	0.00027	-63	-2.19
iaea/leu/sol/therm/016/lst016-004.i	1.00373	0.00010	1.00366	0.00028	7	0.24
iaea/leu/sol/therm/016/lst016-005.i	1.00318	0.00010	1.00343	0.00026	-25	-0.90
iaea/leu/sol/therm/016/lst016-006.i	1.00167	0.00010	1.00124	0.00026	43	1.54
iaea/leu/sol/therm/016/lst016-007.i	1.00268	0.00009	1.00297	0.00025	-29	-1.09
iaea/leu/sol/therm/017/lst017-001.i	1.00206	0.00011	1.00209	0.00028	-3	-0.10
iaea/leu/sol/therm/017/lst017-002.i	1.00237	0.00011	1.00211	0.00026	26	0.92
iaea/leu/sol/therm/017/lst017-003.i	1.00020	0.00010	1.00090	0.00024	-70	-2.69
iaea/leu/sol/therm/017/lst017-004.i	1.00136	0.00010	1.00079	0.00024	57	2.19
iaea/leu/sol/therm/017/lst017-005.i	1.00117	0.00010	1.00094	0.00023	23	0.92
iaea/leu/sol/therm/017/lst017-006.i	1.00085	0.00009	1.00044	0.00023	41	1.66
iaea/leu/sol/therm/018/lst018-001.i	1.00144	0.00012	1.00156	0.00025	-12	-0.43
iaea/leu/sol/therm/018/lst018-002.i	1.00129	0.00021	1.00121	0.00023	8	0.26
iaea/leu/sol/therm/018/lst018-003.i	1.00189	0.00013	1.00186	0.00023	3	0.11
iaea/leu/sol/therm/018/lst018-004.i	1.00187	0.00012	1.00183	0.00023	4	0.15
iaea/leu/sol/therm/018/lst018-005.i	1.00200	0.00012	1.00148	0.00023	52	2.00
iaea/leu/sol/therm/018/lst018-006.i	1.00154	0.00012	1.00103	0.00024	51	1.90
iaea/leu/sol/therm/019/lst019-001.i	1.00227	0.00012	1.00213	0.00023	14	0.54
iaea/leu/sol/therm/019/lst019-002.i	1.00308	0.00012	1.00259	0.00024	49	1.83
iaea/leu/sol/therm/019/lst019-003.i	1.00296	0.00013	1.00318	0.00024	-22	-0.81
iaea/leu/sol/therm/019/lst019-004.i	1.00297	0.00012	1.00260	0.00025	37	1.33
iaea/leu/sol/therm/019/lst019-005.i	1.00310	0.00013	1.00269	0.00025	41	1.46
iaea/leu/sol/therm/019/lst019-006.i	1.00136	0.00012	1.00113	0.00023	23	0.89
iaea/leu/sol/therm/020/lst020-216.i	0.99998	0.00008	0.99924	0.00022	74	3.16
iaea/leu/sol/therm/020/lst020-217.i	0.99947	0.00008	0.99902	0.00021	45	2.00
iaea/leu/sol/therm/020/lst020-220.i	0.99904	0.00007	0.99895	0.00019	9	0.44
iaea/leu/sol/therm/020/lst020-226.i	1.00010	0.00007	1.00001	0.00017	9	0.49
iaea/leu/sol/therm/021/lst021-215.i	0.99783	0.00009	0.99783	0.00020	0	0.00
iaea/leu/sol/therm/021/lst021-218.i	0.99827	0.00008	0.99828	0.00019	-1	-0.05
iaea/leu/sol/therm/021/lst021-221.i	0.99742	0.00008	0.99799	0.00017	-57	-3.03
iaea/leu/sol/therm/021/lst021-223.i	0.99942	0.00007	0.99942	0.00016	0	0.00
iaea/mix/comp/fast/001/mcf001.i	0.98663	0.00016	0.98516	0.00022	147	5.40
iaea/mix/comp/fast/002/mcf002-001.i	0.98568	0.00007	0.98377	0.00023	191	7.94
iaea/mix/met/fast/001/mmf001.i	0.99956	0.00008	1.00008	0.00030	-52	-1.67
iaea/mix/met/fast/003/mmf003.i	1.00063	0.00009	1.00070	0.00030	-7	-0.22
iaea/mix/met/fast/008/mmf008-007.i	1.01890	0.00006	1.00930	0.00016	960	56.18
iaea/mix/met/fast/008/mmf008-007.i	1.01896	0.00006	1.00930	0.00016	966	56.53
iaea/mix/met/fast/011/mmf011-b.i	0.99062	0.00050	0.98740	0.00033	322	5.37
iaea/mix/met/fast/011/mmf011-c.i	0.99705	0.00015	0.99311	0.00031	394	11.44
iaea/mix/met/fast/011/mmf011-d.i	1.00124	0.00015	0.99753	0.00031	371	10.77
iaea/mix/met/fast/011/mmf011-e.i	1.00329	0.00013	0.99936	0.00031	393	11.69
iaea/mix/met/inter/003/mmi003.i	0.97339	0.00010	0.97064	0.00026	275	9.87
iaea/mix/met/inter/004/mmi004.i	0.98189	0.00020	0.97987	0.00029	202	5.73
iaea/pu/comp/mixed/001/pcm001-001.i	1.02501	0.00010	1.02504	0.00040	-3	-0.07
iaea/pu/comp/mixed/001/pcm001-002.i	1.02811	0.00014	1.02654	0.00037	157	3.97
iaea/pu/comp/mixed/001/pcm001-003.i	1.02417	0.00016	1.02152	0.00037	265	6.57
iaea/pu/comp/mixed/001/pcm001-004.i	0.99369	0.00015	0.99270	0.00037	99	2.48
iaea/pu/comp/mixed/001/pcm001-005.i	1.01149	0.00015	1.01130	0.00034	19	0.51
iaea/pu/comp/mixed/002/pcm002-001.i	1.03143	0.00013	1.06971	0.00033	-3828	-107.93
iaea/pu/comp/mixed/002/pcm002-002.i	1.02960	0.00013	1.07046	0.00033	-4086	-115.20
iaea/pu/comp/mixed/002/pcm002-003.i	1.02514	0.00013	1.06794	0.00033	-4280	-120.67
iaea/pu/comp/mixed/002/pcm002-004.i	1.01897	0.00013	1.06609	0.00032	-4712	-136.42

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/pu/comp/mixed/002/pcm002-005.i	1.01520	0.00012	1.06634	0.00032	-5114	-149.64
iaea/pu/comp/mixed/002/pcm002-006.i	1.02563	0.00014	1.06055	0.00030	-3492	-105.48
iaea/pu/comp/mixed/002/pcm002-007.i	1.02421	0.00014	1.06183	0.00031	-3762	-110.60
iaea/pu/comp/mixed/002/pcm002-008.i	1.02272	0.00014	1.06655	0.00030	-4383	-132.39
iaea/pu/comp/mixed/002/pcm002-009.i	1.02289	0.00014	1.07230	0.00030	-4941	-149.25
iaea/pu/comp/mixed/002/pcm002-010.i	1.03225	0.00014	1.08283	0.00030	-5058	-152.78
iaea/pu/comp/mixed/002/pcm002-011.i	1.03003	0.00014	1.07485	0.00030	-4482	-135.38
iaea/pu/comp/mixed/002/pcm002-012.i	1.03065	0.00015	1.06969	0.00032	-3904	-110.47
iaea/pu/comp/mixed/002/pcm002-013.i	1.02836	0.00014	1.06485	0.00032	-3649	-104.47
iaea/pu/comp/mixed/002/pcm002-014.i	1.03204	0.00014	1.06658	0.00031	-3454	-101.54
iaea/pu/comp/mixed/002/pcm002-015.i	1.03004	0.00014	1.06483	0.00031	-3479	-102.28
iaea/pu/comp/mixed/002/pcm002-016.i	1.02604	0.00013	1.06574	0.00030	-3970	-121.42
iaea/pu/comp/mixed/002/pcm002-017.i	1.00259	0.00014	1.05404	0.00030	-5145	-155.41
iaea/pu/comp/mixed/002/pcm002-018.i	1.01172	0.00014	1.05231	0.00030	-4059	-122.61
iaea/pu/comp/mixed/002/pcm002-019.i	1.00896	0.00014	1.04749	0.00030	-3853	-116.38
iaea/pu/comp/mixed/002/pcm002-020.i	1.01085	0.00014	1.04799	0.00030	-3714	-112.19
iaea/pu/comp/mixed/002/pcm002-021.i	1.01182	0.00014	1.04875	0.00030	-3693	-111.55
iaea/pu/comp/mixed/002/pcm002-022.i	1.01515	0.00014	1.05496	0.00031	-3981	-117.04
iaea/pu/comp/mixed/002/pcm002-023.i	1.00736	0.00014	1.05269	0.00029	-4533	-140.77
iaea/pu/comp/mixed/002/pcm002-024.i	1.00807	0.00014	1.05073	0.00029	-4266	-132.47
iaea/pu/comp/mixed/002/pcm002-025.i	1.00786	0.00014	1.05057	0.00028	-4271	-136.43
iaea/pu/comp/mixed/002/pcm002-026.i	1.00921	0.00014	1.05087	0.00029	-4166	-129.37
iaea/pu/comp/mixed/002/pcm002-027.i	1.00944	0.00015	1.04967	0.00029	-4023	-123.22
iaea/pu/comp/mixed/002/pcm002-028.i	1.00960	0.00014	1.04898	0.00030	-3938	-118.95
iaea/pu/comp/mixed/002/pcm002-029.i	1.01108	0.00014	1.04853	0.00030	-3745	-113.12
iaea/pu/met/fast/001/pmf001-001d.i	1.00073	0.00004	1.00070	0.00037	3	0.08
iaea/pu/met/fast/001/pmf001-002d.i	1.00125	0.00004	1.00148	0.00035	-23	-0.65
iaea/pu/met/fast/001/pmf001-003d.i	1.00082	0.00004	1.00138	0.00037	-56	-1.50
iaea/pu/met/fast/001/pmf001-004d.i	1.00192	0.00004	1.00213	0.00037	-21	-0.56
iaea/pu/met/fast/001/pmf001.i	0.99986	0.00006	1.00054	0.00031	-68	-2.15
iaea/pu/met/fast/002/pmf002.i	1.00005	0.00006	0.99972	0.00032	33	1.01
iaea/pu/met/fast/005/pmf005.i	1.00107	0.00008	1.00174	0.00033	-67	-1.97
iaea/pu/met/fast/006/pmf006.i	1.00097	0.00008	1.00201	0.00036	-104	-2.82
iaea/pu/met/fast/008/pmf008.i	0.99758	0.00014	0.99830	0.00035	-72	-1.91
iaea/pu/met/fast/009/pmf009.i	1.00576	0.00006	0.99929	0.00031	647	20.49
iaea/pu/met/fast/010/pmf010.i	0.99957	0.00009	1.00069	0.00031	-112	-3.47
iaea/pu/met/fast/011/pmf011.i	1.00023	0.00011	1.00093	0.00040	-70	-1.69
iaea/pu/met/fast/018/pmf018.i	0.99941	0.00009	0.99981	0.00031	-40	-1.24
iaea/pu/met/fast/019/pmf019.i	1.00082	0.00010	1.00131	0.00032	-49	-1.46
iaea/pu/met/fast/020/pmf020.i	0.99817	0.00013	0.99937	0.00031	-120	-3.57
iaea/pu/met/fast/022/pmf022.i	0.99853	0.00008	0.99810	0.00030	43	1.38
iaea/pu/met/fast/029/pmf029.i	0.99552	0.00011	0.99567	0.00031	-15	-0.46
iaea/pu/met/fast/031/pmf031-001.i	1.00469	0.00014	1.01029	0.00033	-560	-15.62
iaea/pu/met/fast/033/pmf033.i	0.99597	0.00014	0.99245	0.00032	352	10.08
iaea/pu/met/fast/041/pmf041.i	1.00509	0.00017	1.00578	0.00035	-69	-1.77
iaea/pu/met/fast/044/pmf044-001.i	1.00069	0.00010	0.99611	0.00032	458	13.66
iaea/pu/met/fast/044/pmf044-002.i	1.00015	0.00010	0.99516	0.00032	499	14.88
iaea/pu/met/fast/044/pmf044-003.i	0.99960	0.00010	0.99469	0.00033	491	14.24
iaea/pu/met/fast/044/pmf044-004.i	1.00025	0.00010	0.99484	0.00033	541	15.69
iaea/pu/met/fast/044/pmf044-005.i	0.99977	0.00010	0.99346	0.00031	631	19.37
iaea/pu/met/inter/002/pmi002.i	1.01466	0.00040	1.01302	0.00028	164	3.36
iaea/pu/met/inter/003/pmi003-001s.i	0.98789	0.00010	0.98430	0.00032	359	10.71
iaea/pu/met/inter/004/pmi004-001s.i	0.97482	0.00011	0.97120	0.00030	362	11.33
iaea/pu/sol/therm/001/pst001-001.i	1.00459	0.00033	1.00483	0.00036	-24	-0.49

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/pu/sol/therm/001/pst001-002.i	1.00719	0.00033	1.00748	0.00036	-29	-0.59
iaea/pu/sol/therm/001/pst001-003.i	1.00943	0.00030	1.00992	0.00037	-49	-1.03
iaea/pu/sol/therm/001/pst001-004.i	1.00382	0.00031	1.00366	0.00036	16	0.34
iaea/pu/sol/therm/001/pst001-005.i	1.00749	0.00028	1.00845	0.00036	-96	-2.10
iaea/pu/sol/therm/001/pst001-006.i	1.00920	0.00028	1.00856	0.00035	64	1.43
iaea/pu/sol/therm/002/pst002-001.i	1.00371	0.00012	1.00392	0.00035	-21	-0.57
iaea/pu/sol/therm/002/pst002-002.i	1.00503	0.00012	1.00450	0.00036	53	1.40
iaea/pu/sol/therm/002/pst002-003.i	1.00383	0.00012	1.00363	0.00035	20	0.54
iaea/pu/sol/therm/002/pst002-004.i	1.00650	0.00012	1.00681	0.00035	-31	-0.84
iaea/pu/sol/therm/002/pst002-005.i	1.00933	0.00013	1.00922	0.00035	11	0.29
iaea/pu/sol/therm/002/pst002-006.i	1.00498	0.00013	1.00543	0.00035	-45	-1.21
iaea/pu/sol/therm/002/pst002-007.i	1.00753	0.00012	1.00795	0.00035	-42	-1.14
iaea/pu/sol/therm/003/pst003-001.i	1.00279	0.00013	1.00250	0.00032	29	0.84
iaea/pu/sol/therm/003/pst003-002.i	1.00251	0.00013	1.00231	0.00032	20	0.58
iaea/pu/sol/therm/003/pst003-003.i	1.00504	0.00013	1.00482	0.00032	22	0.64
iaea/pu/sol/therm/003/pst003-004.i	1.00421	0.00013	1.00441	0.00032	-20	-0.58
iaea/pu/sol/therm/003/pst003-005.i	1.00566	0.00013	1.00550	0.00033	16	0.45
iaea/pu/sol/therm/003/pst003-006.i	1.00603	0.00013	1.00580	0.00034	23	0.63
iaea/pu/sol/therm/003/pst003-007.i	1.00703	0.00012	1.00653	0.00033	50	1.42
iaea/pu/sol/therm/003/pst003-008.i	1.00556	0.00014	1.00513	0.00034	43	1.17
iaea/pu/sol/therm/004/pst004-001.i	1.00400	0.00029	1.00311	0.00032	89	2.06
iaea/pu/sol/therm/004/pst004-002.i	0.99873	0.00026	0.99819	0.00031	54	1.33
iaea/pu/sol/therm/004/pst004-003.i	1.00076	0.00025	1.00035	0.00031	41	1.03
iaea/pu/sol/therm/004/pst004-004.i	0.99877	0.00029	0.99860	0.00031	17	0.40
iaea/pu/sol/therm/004/pst004-005.i	0.99980	0.00017	0.99972	0.00032	8	0.22
iaea/pu/sol/therm/004/pst004-006.i	1.00144	0.00024	1.00130	0.00031	14	0.36
iaea/pu/sol/therm/004/pst004-007.i	1.00556	0.00017	1.00524	0.00031	32	0.91
iaea/pu/sol/therm/004/pst004-008.i	1.00175	0.00025	1.00096	0.00031	79	1.98
iaea/pu/sol/therm/004/pst004-009.i	1.00054	0.00026	1.00082	0.00032	-28	-0.68
iaea/pu/sol/therm/004/pst004-010.i	1.00162	0.00028	1.00145	0.00032	17	0.40
iaea/pu/sol/therm/004/pst004-011.i	1.00065	0.00027	1.00048	0.00032	17	0.41
iaea/pu/sol/therm/004/pst004-012.i	1.00269	0.00030	1.00254	0.00032	15	0.34
iaea/pu/sol/therm/004/pst004-013.i	1.00007	0.00028	1.00020	0.00031	-13	-0.31
iaea/pu/sol/therm/005/pst005-001.i	1.00184	0.00026	1.00242	0.00031	-58	-1.43
iaea/pu/sol/therm/005/pst005-002.i	1.00227	0.00028	1.00200	0.00032	27	0.63
iaea/pu/sol/therm/005/pst005-003.i	1.00331	0.00029	1.00302	0.00031	29	0.68
iaea/pu/sol/therm/005/pst005-004.i	1.00465	0.00027	1.00490	0.00032	-25	-0.60
iaea/pu/sol/therm/005/pst005-005.i	1.00563	0.00025	1.00631	0.00033	-68	-1.64
iaea/pu/sol/therm/005/pst005-006.i	1.00492	0.00029	1.00561	0.00032	-69	-1.60
iaea/pu/sol/therm/005/pst005-007.i	1.00356	0.00033	1.00378	0.00032	-22	-0.48
iaea/pu/sol/therm/005/pst005-008.i	0.99935	0.00026	0.99914	0.00032	21	0.51
iaea/pu/sol/therm/005/pst005-009.i	1.00165	0.00027	1.00131	0.00030	34	0.84
iaea/pu/sol/therm/006/pst006-001.i	1.00033	0.00028	1.00002	0.00030	31	0.76
iaea/pu/sol/therm/006/pst006-002.i	1.00157	0.00023	1.00145	0.00031	12	0.31
iaea/pu/sol/therm/006/pst006-003.i	1.00055	0.00026	1.00151	0.00031	-96	-2.37
iaea/pu/sol/therm/007/pst007-002.i	1.00938	0.00013	1.00986	0.00036	-48	-1.25
iaea/pu/sol/therm/007/pst007-003.i	1.00359	0.00013	1.00417	0.00036	-58	-1.52
iaea/pu/sol/therm/007/pst007-005.i	1.00928	0.00013	1.00945	0.00036	-17	-0.44
iaea/pu/sol/therm/007/pst007-006.i	1.00324	0.00013	1.00325	0.00036	-1	-0.03
iaea/pu/sol/therm/007/pst007-007.i	1.00529	0.00013	1.00535	0.00036	-6	-0.16
iaea/pu/sol/therm/007/pst007-008.i	0.99888	0.00014	0.99923	0.00037	-35	-0.88
iaea/pu/sol/therm/007/pst007-009.i	0.99708	0.00013	0.99753	0.00036	-45	-1.18
iaea/pu/sol/therm/007/pst007-010.i	1.00092	0.00012	1.00075	0.00037	17	0.44
iaea/pu/sol/therm/008/pst008-016.i	1.00269	0.00012	1.00921	0.00029	-652	-20.77

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/pu/sol/therm/008/pst008-016.i	1.00840	0.00012	1.00921	0.00029	-81	-2.58
iaea/pu/sol/therm/008/pst008-016.i	1.01045	0.00013	1.00921	0.00029	124	3.90
iaea/pu/sol/therm/008/pst008-017.i	1.01231	0.00012	1.01328	0.00029	-97	-3.09
iaea/pu/sol/therm/008/pst008-018.i	1.01593	0.00012	1.01623	0.00030	-30	-0.93
iaea/pu/sol/therm/008/pst008-019.i	1.00931	0.00012	1.00922	0.00029	9	0.29
iaea/pu/sol/therm/008/pst008-020.i	1.00999	0.00011	1.00924	0.00029	75	2.42
iaea/pu/sol/therm/008/pst008-023.i	1.01709	0.00012	1.01783	0.00031	-74	-2.23
iaea/pu/sol/therm/008/pst008-024.i	1.00841	0.00011	1.00922	0.00031	-81	-2.46
iaea/pu/sol/therm/008/pst008-025.i	1.01526	0.00013	1.01610	0.00032	-84	-2.43
iaea/pu/sol/therm/008/pst008-026.i	1.01307	0.00013	1.01361	0.00032	-54	-1.56
iaea/pu/sol/therm/008/pst008-027.i	1.01107	0.00014	1.01076	0.00034	31	0.84
iaea/pu/sol/therm/008/pst008-028.i	1.00444	0.00014	1.00485	0.00035	-41	-1.09
iaea/pu/sol/therm/008/pst008-029.i	1.01331	0.00013	1.01356	0.00032	-25	-0.72
iaea/pu/sol/therm/009/pst009-001a.i	1.01553	0.00008	1.01511	0.00013	42	2.75
iaea/pu/sol/therm/009/pst009-002a.i	1.02028	0.00006	1.01991	0.00013	37	2.58
iaea/pu/sol/therm/009/pst009-003a.i	1.01920	0.00006	1.01871	0.00011	49	3.91
iaea/pu/sol/therm/010/pst010-001.i	1.00976	0.00011	1.01728	0.00037	-752	-19.48
iaea/pu/sol/therm/010/pst010-001.i	1.01473	0.00013	1.01728	0.00037	-255	-6.50
iaea/pu/sol/therm/010/pst010-001.i	1.01839	0.00013	1.01728	0.00037	111	2.83
iaea/pu/sol/therm/010/pst010-003.i	1.00827	0.00012	1.00797	0.00035	30	0.81
iaea/pu/sol/therm/010/pst010-004.i	1.01252	0.00012	1.01225	0.00034	27	0.75
iaea/pu/sol/therm/010/pst010-005.i	1.01019	0.00012	1.01009	0.00035	10	0.27
iaea/pu/sol/therm/010/pst010-006.i	1.00939	0.00012	1.00983	0.00034	-44	-1.22
iaea/pu/sol/therm/010/pst010-007.i	1.00245	0.00011	1.00254	0.00034	-9	-0.25
iaea/pu/sol/therm/010/pst010-008.i	1.00379	0.00011	1.00339	0.00033	40	1.15
iaea/pu/sol/therm/010/pst010-009.i	1.01493	0.00013	1.01417	0.00037	76	1.94
iaea/pu/sol/therm/010/pst010-010.i	1.00293	0.00012	1.00241	0.00035	52	1.41
iaea/pu/sol/therm/010/pst010-011.i	1.00971	0.00012	1.00965	0.00034	6	0.17
iaea/pu/sol/therm/010/pst010-012.i	1.00971	0.00012	1.00911	0.00035	60	1.62
iaea/pu/sol/therm/010/pst010-013.i	1.01571	0.00011	1.01558	0.00031	13	0.40
iaea/pu/sol/therm/011/pst011-161.i	1.00988	0.00013	1.00964	0.00030	24	0.73
iaea/pu/sol/therm/011/pst011-162.i	1.01482	0.00013	1.01425	0.00031	57	1.70
iaea/pu/sol/therm/011/pst011-163.i	1.01666	0.00012	1.01650	0.00029	16	0.51
iaea/pu/sol/therm/011/pst011-164.i	1.00917	0.00013	1.00936	0.00030	-19	-0.58
iaea/pu/sol/therm/011/pst011-165.i	1.00614	0.00013	1.00699	0.00031	-85	-2.53
iaea/pu/sol/therm/011/pst011-181.i	0.99424	0.00011	0.99488	0.00027	-64	-2.20
iaea/pu/sol/therm/011/pst011-182.i	1.00030	0.00011	1.00061	0.00026	-31	-1.10
iaea/pu/sol/therm/011/pst011-183.i	0.99710	0.00011	0.99677	0.00027	33	1.13
iaea/pu/sol/therm/011/pst011-184.i	0.99344	0.00012	0.99359	0.00027	-15	-0.51
iaea/pu/sol/therm/011/pst011-185.i	1.00380	0.00011	1.00337	0.00028	43	1.43
iaea/pu/sol/therm/011/pst011-186.i	1.00041	0.00012	1.00016	0.00028	25	0.82
iaea/pu/sol/therm/011/pst011-187.i	0.99991	0.00011	0.99942	0.00027	49	1.68
iaea/pu/sol/therm/012/pst012-001.i	1.00562	0.00009	1.00516	0.00023	46	1.86
iaea/pu/sol/therm/012/pst012-002.i	1.00625	0.00008	1.00625	0.00021	0	0.00
iaea/pu/sol/therm/012/pst012-003.i	1.00727	0.00008	1.00682	0.00020	45	2.09
iaea/pu/sol/therm/012/pst012-004.i	1.00763	0.00007	1.00729	0.00017	34	1.85
iaea/pu/sol/therm/012/pst012-005.i	1.00971	0.00006	1.01024	0.00015	-53	-3.28
iaea/pu/sol/therm/012/pst012-006.i	1.00689	0.00013	1.00731	0.00032	-42	-1.22
iaea/pu/sol/therm/012/pst012-007.i	1.00537	0.00013	1.00621	0.00032	-84	-2.43
iaea/pu/sol/therm/012/pst012-008.i	1.00434	0.00012	1.00410	0.00029	24	0.76
iaea/pu/sol/therm/012/pst012-009.i	1.00977	0.00011	1.00984	0.00026	-7	-0.25
iaea/pu/sol/therm/012/pst012-010.i	1.00374	0.00010	1.00383	0.00025	-9	-0.33
iaea/pu/sol/therm/012/pst012-011.i	1.00679	0.00009	1.00690	0.00023	-11	-0.45
iaea/pu/sol/therm/012/pst012-012.i	1.00698	0.00009	1.00695	0.00021	3	0.13

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/pu/sol/therm/012/pst012-013.i	1.00960	0.00007	1.00995	0.00014	-35	-2.24
iaea/pu/sol/therm/018/pst018-001.i	1.00854	0.00012	1.01034	0.00025	-180	-6.49
iaea/pu/sol/therm/018/pst018-002.i	1.01151	0.00012	1.01321	0.00027	-170	-5.75
iaea/pu/sol/therm/018/pst018-003.i	1.00954	0.00012	1.01113	0.00025	-159	-5.73
iaea/pu/sol/therm/018/pst018-004.i	1.00730	0.00012	1.00876	0.00026	-146	-5.10
iaea/pu/sol/therm/018/pst018-005.i	1.00646	0.00012	1.00782	0.00025	-136	-4.90
iaea/pu/sol/therm/018/pst018-006.i	1.00463	0.00012	1.00516	0.00025	-53	-1.91
iaea/pu/sol/therm/018/pst018-007.i	1.00384	0.00011	1.00442	0.00024	-58	-2.20
iaea/pu/sol/therm/018/pst018-008.i	1.00379	0.00010	1.00433	0.00023	-54	-2.15
iaea/pu/sol/therm/018/pst018-009.i	1.00190	0.00010	1.00231	0.00021	-41	-1.76
iaea/pu/sol/therm/020/pst020-001.i	1.00376	0.00011	1.00419	0.00032	-43	-1.27
iaea/pu/sol/therm/020/pst020-002.i	1.00614	0.00012	1.00611	0.00032	3	0.09
iaea/pu/sol/therm/020/pst020-003.i	1.00079	0.00012	1.00074	0.00033	5	0.14
iaea/pu/sol/therm/020/pst020-006.i	1.00433	0.00012	1.00485	0.00034	-52	-1.44
iaea/pu/sol/therm/020/pst020-007.i	0.99857	0.00012	0.99810	0.00032	47	1.38
iaea/pu/sol/therm/020/pst020-008.i	1.00388	0.00014	1.00366	0.00037	22	0.56
iaea/pu/sol/therm/020/pst020-009.i	0.99510	0.00013	0.99542	0.00034	-32	-0.88
iaea/pu/sol/therm/021/pst021-001.i	1.00490	0.00013	1.00524	0.00031	-34	-1.01
iaea/pu/sol/therm/021/pst021-003.i	1.00457	0.00015	1.00466	0.00034	-9	-0.24
iaea/pu/sol/therm/022/pst022-001.i	0.99973	0.00013	1.00026	0.00032	-53	-1.53
iaea/pu/sol/therm/022/pst022-002.i	1.00206	0.00013	1.00274	0.00031	-68	-2.02
iaea/pu/sol/therm/022/pst022-003.i	1.00095	0.00012	1.00100	0.00030	-5	-0.15
iaea/pu/sol/therm/022/pst022-004.i	1.00128	0.00012	1.00169	0.00030	-41	-1.27
iaea/pu/sol/therm/022/pst022-005.i	1.00214	0.00011	1.00214	0.00029	0	0.00
iaea/pu/sol/therm/022/pst022-006.i	1.00279	0.00011	1.00334	0.00028	-55	-1.83
iaea/pu/sol/therm/022/pst022-007.i	1.00425	0.00011	1.00401	0.00027	24	0.82
iaea/pu/sol/therm/022/pst022-008.i	1.00481	0.00010	1.00492	0.00026	-11	-0.39
iaea/pu/sol/therm/022/pst022-009.i	1.00381	0.00010	1.00333	0.00025	48	1.78
iaea/pu/sol/therm/022/pst022-010.i	0.99940	0.00013	1.00006	0.00032	-66	-1.91
iaea/pu/sol/therm/022/pst022-011.i	0.99515	0.00013	0.99592	0.00034	-77	-2.12
iaea/pu/sol/therm/022/pst022-012.i	0.99783	0.00013	0.99823	0.00033	-40	-1.13
iaea/pu/sol/therm/022/pst022-013.i	0.99630	0.00013	0.99718	0.00032	-88	-2.55
iaea/pu/sol/therm/022/pst022-014.i	0.99504	0.00013	0.99510	0.00032	-6	-0.17
iaea/pu/sol/therm/022/pst022-015.i	0.99359	0.00012	0.99370	0.00030	-11	-0.34
iaea/pu/sol/therm/022/pst022-016.i	0.99491	0.00012	0.99490	0.00031	1	0.03
iaea/pu/sol/therm/022/pst022-017.i	0.99567	0.00011	0.99563	0.00029	4	0.13
iaea/pu/sol/therm/028/pst028-001.i	1.00787	0.00012	1.00809	0.00033	-22	-0.63
iaea/pu/sol/therm/028/pst028-002.i	1.00725	0.00012	1.00744	0.00035	-19	-0.51
iaea/pu/sol/therm/028/pst028-003.i	1.00904	0.00012	1.00836	0.00032	68	1.99
iaea/pu/sol/therm/028/pst028-004.i	1.00853	0.00012	1.00903	0.00032	-50	-1.46
iaea/pu/sol/therm/028/pst028-005.i	1.00999	0.00011	1.00987	0.00032	12	0.35
iaea/pu/sol/therm/028/pst028-006.i	1.01091	0.00011	1.01141	0.00030	-50	-1.56
iaea/pu/sol/therm/028/pst028-007.i	1.00829	0.00012	1.00791	0.00033	38	1.08
iaea/pu/sol/therm/028/pst028-008.i	1.00816	0.00011	1.00848	0.00034	-32	-0.90
iaea/pu/sol/therm/028/pst028-009.i	1.00983	0.00012	1.00990	0.00032	-7	-0.20
iaea/pu/sol/therm/032/pst032-001.i	0.99597	0.00013	0.99610	0.00033	-13	-0.37
iaea/pu/sol/therm/032/pst032-002.i	1.00144	0.00012	1.00151	0.00033	-7	-0.20
iaea/pu/sol/therm/032/pst032-003.i	1.00291	0.00012	1.00288	0.00031	3	0.09
iaea/pu/sol/therm/032/pst032-004.i	1.00256	0.00012	1.00272	0.00031	-16	-0.48
iaea/pu/sol/therm/032/pst032-005.i	1.00463	0.00012	1.00452	0.00031	11	0.33
iaea/pu/sol/therm/032/pst032-006.i	1.00478	0.00011	1.00493	0.00030	-15	-0.47
iaea/pu/sol/therm/032/pst032-007.i	1.00526	0.00011	1.00544	0.00029	-18	-0.58
iaea/pu/sol/therm/032/pst032-008.i	1.00460	0.00011	1.00473	0.00028	-13	-0.43
iaea/pu/sol/therm/032/pst032-009.i	1.00310	0.00010	1.00300	0.00027	10	0.35

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/pu/sol/therm/032/pst032-010.i	1.00514	0.00010	1.00474	0.00027	40	1.39
iaea/pu/sol/therm/032/pst032-011.i	1.00465	0.00010	1.00478	0.00027	-13	-0.45
iaea/pu/sol/therm/032/pst032-012.i	1.00376	0.00010	1.00336	0.00027	40	1.39
iaea/pu/sol/therm/032/pst032-013.i	1.00229	0.00012	1.00190	0.00032	39	1.14
iaea/pu/sol/therm/032/pst032-014.i	1.00184	0.00011	1.00192	0.00030	-8	-0.25
iaea/pu/sol/therm/032/pst032-015.i	1.00406	0.00011	1.00401	0.00031	5	0.15
iaea/pu/sol/therm/032/pst032-016.i	1.00399	0.00011	1.00387	0.00029	12	0.39
iaea/pu/sol/therm/032/pst032-017.i	1.00384	0.00010	1.00408	0.00029	-24	-0.78
iaea/pu/sol/therm/033/pst033-001.i	0.99665	0.00013	0.99648	0.00034	17	0.47
iaea/pu/sol/therm/033/pst033-002.i	0.99539	0.00013	0.99578	0.00035	-39	-1.04
iaea/pu/sol/therm/033/pst033-003.i	0.99353	0.00014	0.99399	0.00035	-46	-1.22
iaea/pu/sol/therm/033/pst033-004.i	0.99211	0.00014	0.99285	0.00035	-74	-1.96
iaea/pu/sol/therm/033/pst033-005.i	0.98926	0.00013	0.98997	0.00034	-71	-1.95
iaea/pu/sol/therm/033/pst033-006.i	0.99015	0.00013	0.99082	0.00035	-67	-1.79
iaea/pu/sol/therm/033/pst033-007.i	0.99051	0.00013	0.99067	0.00037	-16	-0.41
iaea/pu/sol/therm/033/pst033-008.i	0.99114	0.00013	0.99158	0.00035	-44	-1.18
iaea/pu/sol/therm/033/pst033-009.i	0.99324	0.00014	0.99379	0.00035	-55	-1.46
iaea/pu/sol/therm/033/pst033-010.i	0.99392	0.00013	0.99426	0.00035	-34	-0.91
iaea/pu/sol/therm/033/pst033-011.i	0.99371	0.00013	0.99440	0.00036	-69	-1.80
iaea/pu/sol/therm/033/pst033-012.i	0.99875	0.00013	0.99876	0.00035	-1	-0.03
iaea/pu/sol/therm/033/pst033-013.i	0.99380	0.00014	0.99446	0.00036	-66	-1.71
iaea/pu/sol/therm/033/pst033-014.i	0.99497	0.00013	0.99460	0.00036	37	0.97
iaea/pu/sol/therm/034/pst034-001.i	1.00017	0.00014	0.99983	0.00036	34	0.88
iaea/pu/sol/therm/034/pst034-002.i	1.00184	0.00012	1.00173	0.00029	11	0.35
iaea/pu/sol/therm/034/pst034-003.i	0.99951	0.00011	0.99872	0.00026	79	2.80
iaea/pu/sol/therm/034/pst034-004.i	1.00265	0.00012	1.00181	0.00023	84	3.24
iaea/pu/sol/therm/034/pst034-005.i	0.99988	0.00011	0.99925	0.00021	63	2.66
iaea/pu/sol/therm/034/pst034-006.i	1.00125	0.00010	1.00072	0.00020	53	2.37
iaea/pu/sol/therm/034/pst034-007.i	0.99878	0.00012	0.99828	0.00028	50	1.64
iaea/pu/sol/therm/034/pst034-008.i	0.99919	0.00012	0.99818	0.00027	101	3.42
iaea/pu/sol/therm/034/pst034-009.i	0.99774	0.00012	0.99749	0.00027	25	0.85
iaea/pu/sol/therm/034/pst034-010.i	0.99736	0.00012	0.99647	0.00026	89	3.11
iaea/pu/sol/therm/034/pst034-011.i	0.99878	0.00011	0.99810	0.00026	68	2.41
iaea/pu/sol/therm/034/pst034-012.i	0.99850	0.00011	0.99709	0.00026	141	4.99
iaea/pu/sol/therm/034/pst034-013.i	0.99711	0.00011	0.99571	0.00024	140	5.30
iaea/pu/sol/therm/034/pst034-014.i	0.99686	0.00011	0.99545	0.00025	141	5.16
iaea/pu/sol/therm/034/pst034-015.i	0.99741	0.00011	0.99550	0.00025	191	6.99
iaea/pu/sol/therm/038/pst038-001.i	1.00312	0.00009	1.00331	0.00022	-19	-0.80
iaea/pu/sol/therm/038/pst038-002.i	1.00362	0.00009	1.00321	0.00023	41	1.66
iaea/pu/sol/therm/038/pst038-003.i	1.00241	0.00007	1.00250	0.00018	-9	-0.47
iaea/pu/sol/therm/038/pst038-004.i	1.00164	0.00007	1.00137	0.00016	27	1.55
iaea/pu/sol/therm/038/pst038-005.i	1.00185	0.00007	1.00216	0.00016	-31	-1.78
iaea/u233/met/fast/001/umf001.i	0.99978	0.00006	1.00031	0.00030	-53	-1.73
iaea/u233/met/fast/002/umf002-001.i	1.00017	0.00010	0.99974	0.00030	43	1.36
iaea/u233/met/fast/002/umf002-002.i	0.99882	0.00011	0.99962	0.00030	-80	-2.50
iaea/u233/met/fast/003/umf003-001.i	0.99799	0.00011	0.99855	0.00029	-56	-1.81
iaea/u233/met/fast/003/umf003-002.i	0.99767	0.00012	0.99865	0.00030	-98	-3.03
iaea/u233/met/fast/004/umf004-001.i	0.99841	0.00006	0.99889	0.00029	-48	-1.62
iaea/u233/met/fast/004/umf004-002.i	0.99537	0.00006	0.99584	0.00030	-47	-1.54
iaea/u233/met/fast/005/umf005-001.i	0.99607	0.00011	0.99654	0.00030	-47	-1.47
iaea/u233/met/fast/005/umf005-002.i	0.99539	0.00012	0.99589	0.00030	-50	-1.55
iaea/u233/met/fast/006/umf006.i	0.99869	0.00018	0.99975	0.00035	-106	-2.69
iaea/u233/sol/therm/001/ust001-001.i	1.00139	0.00013	1.00103	0.00018	36	1.62
iaea/u233/sol/therm/001/ust001-002.i	1.00137	0.00014	1.00104	0.00019	33	1.40

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	Δ (pcm)	Δ (rel. sig.)
iaea/u233/sol/therm/001/ust001-003.i	1.00169	0.00013	1.00128	0.00018	41	1.85
iaea/u233/sol/therm/001/ust001-004.i	1.00078	0.00013	1.00068	0.00018	10	0.45
iaea/u233/sol/therm/001/ust001-005.i	1.00009	0.00014	0.99995	0.00018	14	0.61
iaea/u233/sol/therm/005/ust005-001.i	1.00205	0.00019	1.00202	0.00037	3	0.07
iaea/u233/sol/therm/005/ust005-002.i	1.00537	0.00016	1.00416	0.00036	121	3.07
iaea/u233/sol/therm/008/ust008.i	1.00180	0.00012	1.00132	0.00011	48	2.95
iaea/u233/sol/therm/012/ust012-001.i	1.00076	0.00017	1.00083	0.00043	-7	-0.15
iaea/u233/sol/therm/012/ust012-002.i	1.00000	0.00016	0.99965	0.00044	35	0.75
iaea/u233/sol/therm/012/ust012-003.i	1.00952	0.00017	1.00962	0.00042	-10	-0.22
iaea/u233/sol/therm/012/ust012-004.i	1.00294	0.00016	1.00225	0.00043	69	1.50
iaea/u233/sol/therm/012/ust012-005.i	1.00496	0.00016	1.00424	0.00040	72	1.67
iaea/u233/sol/therm/012/ust012-006.i	1.00569	0.00015	1.00487	0.00040	82	1.92
iaea/u233/sol/therm/012/ust012-007.i	1.00169	0.00014	1.00193	0.00036	-24	-0.62
iaea/u233/sol/therm/012/ust012-008.i	0.99906	0.00014	0.99945	0.00036	-39	-1.01

Table A.3. Comparison of UPM MCNP results to Serpent-2 results

All calculations use ENDF/B-7.1

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	delta	delta (sig)
HEU-COMP-INTER-003-007	0.99683	0.00037	0.99779	0.00028	-96	-2.07
HEU-MET-FAST-001-001	0.99972	0.00027	1.00002	0.00028	-30	-0.77
HEU-MET-FAST-003-001	0.99478	0.00027	0.99621	0.00029	-143	-3.61
HEU-MET-FAST-003-002	0.99440	0.00030	0.99539	0.00029	-99	-2.37
HEU-MET-FAST-003-003	0.99920	0.00029	0.99950	0.00029	-30	-0.73
HEU-MET-FAST-003-004	0.99696	0.00028	0.99832	0.00030	-136	-3.31
HEU-MET-FAST-003-005	1.00113	0.00029	1.00142	0.00031	-29	-0.68
HEU-MET-FAST-003-006	1.00113	0.00029	1.00123	0.00032	-10	-0.23
HEU-MET-FAST-003-007	1.00189	0.00029	1.00195	0.00032	-6	-0.14
HEU-MET-FAST-003-008	1.00167	0.00029	1.00131	0.00027	36	0.91
HEU-MET-FAST-003-009	1.00166	0.00029	1.00110	0.00028	56	1.39
HEU-MET-FAST-003-010	1.00505	0.00029	1.00304	0.00029	201	4.90
HEU-MET-FAST-003-011	1.01017	0.00028	1.00640	0.00031	377	9.02
HEU-MET-FAST-003-012	1.00946	0.00028	1.00937	0.00028	9	0.23
HEU-MET-FAST-004-001	0.99973	0.00033	1.00027	0.00036	-54	-1.11
HEU-MET-FAST-008-001	0.99585	0.00028	0.99606	0.00029	-21	-0.52
HEU-MET-FAST-009-001	0.99699	0.00028	0.99716	0.00027	-17	-0.44
HEU-MET-FAST-009-002	0.99694	0.00030	0.99699	0.00027	-5	-0.12
HEU-MET-FAST-011-001	0.99892	0.00035	1.01652	0.00031	-1760	-37.64
HEU-MET-FAST-012-001	0.99792	0.00028	0.99805	0.00028	-13	-0.33
HEU-MET-FAST-013-001	0.99715	0.00028	0.99759	0.00027	-44	-1.13
HEU-MET-FAST-014-001	0.99771	0.00027	0.99855	0.00027	-84	-2.20
HEU-MET-FAST-015-001	0.99465	0.00026	0.99467	0.00027	-2	-0.05
HEU-MET-FAST-018-001	0.99924	0.00028	0.99924	0.00028	0	0.00
HEU-MET-FAST-019-001	1.00727	0.00029	1.00459	0.00028	268	6.65
HEU-MET-FAST-020-001	1.00054	0.00028	0.99998	0.00029	56	1.39
HEU-MET-FAST-021-001	0.99744	0.00028	0.99772	0.00027	-28	-0.72
HEU-MET-FAST-022-001	0.99774	0.00027	0.99713	0.00027	61	1.60
HEU-MET-FAST-028-001	1.00260	0.00029	1.00366	0.00031	-106	-2.50
HEU-MET-FAST-073-001	1.01183	0.00027	1.01198	0.00029	-15	-0.38
HEU-MET-INTER-006-001	0.99341	0.00034	0.98997	0.00029	344	7.70
HEU-MET-INTER-006-002	0.99623	0.00033	0.99223	0.00028	400	9.24
HEU-MET-INTER-006-003	0.99955	0.00035	0.99559	0.00030	396	8.59
HEU-MET-INTER-006-004	1.00688	0.00034	1.00451	0.00030	237	5.23

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	delta	delta (sig)
HEU-SOL-THERM-013-001	0.99821	0.00026	0.99874	0.00019	-53	-1.65
HEU-SOL-THERM-013-002	0.99744	0.00028	0.99742	0.00019	2	0.06
HEU-SOL-THERM-013-003	0.99400	0.00028	0.99398	0.00019	2	0.06
HEU-SOL-THERM-013-004	0.99556	0.00028	0.99531	0.00018	25	0.75
HEU-SOL-THERM-032-001	0.99945	0.00016	0.99931	0.00011	14	0.72
IEU-MET-FAST-001-001	1.00085	0.00029	1.00106	0.00028	-21	-0.52
IEU-MET-FAST-001-002	1.00044	0.00029	1.00077	0.00027	-33	-0.83
IEU-MET-FAST-001-003	1.00108	0.00028	1.00184	0.00026	-76	-1.99
IEU-MET-FAST-001-004	1.00094	0.00028	1.00203	0.00026	-109	-2.85
IEU-MET-FAST-002-001	0.99902	0.00024	0.99802	0.00023	100	3.01
IEU-MET-FAST-003-001	1.00229	0.00028	1.00331	0.00025	-102	-2.72
IEU-MET-FAST-004-001	1.00706	0.00028	1.00610	0.00025	96	2.56
IEU-MET-FAST-005-001	1.00127	0.00027	1.00140	0.00025	-13	-0.35
IEU-MET-FAST-006-001	0.99603	0.00028	0.99660	0.00024	-57	-1.55
IEU-MET-FAST-007-001	1.00434	0.00023	1.00056	0.00024	378	11.37
LEU-COMP-THERM-008-001	0.99992	0.00028	1.00024	0.00019	-32	-0.95
LEU-COMP-THERM-008-002	1.00038	0.00030	1.00012	0.00019	26	0.73
LEU-COMP-THERM-008-005	0.99944	0.00029	0.99856	0.00020	88	2.50
LEU-COMP-THERM-008-007	0.99950	0.00031	0.99784	0.00021	166	4.43
LEU-COMP-THERM-008-008	0.99849	0.00033	0.99485	0.00022	364	9.18
LEU-COMP-THERM-008-011	1.00005	0.00028	1.00013	0.00019	-8	-0.24
LEU-SOL-THERM-002-001	1.00041	0.00024	0.99952	0.00020	89	2.85
LEU-SOL-THERM-002-002	0.99613	0.00028	0.99534	0.00021	79	2.26
LEU-SOL-THERM-007-001	0.99480	0.00030	0.99439	0.00023	41	1.08
LEU-SOL-THERM-007-002	0.99706	0.00030	0.99717	0.00022	-11	-0.30
LEU-SOL-THERM-007-003	0.99632	0.00028	0.99564	0.00021	68	1.94
LEU-SOL-THERM-007-004	0.99836	0.00027	0.99833	0.00020	3	0.09
LEU-SOL-THERM-007-005	0.99684	0.00026	0.99731	0.00019	-47	-1.46
MIX-MET-FAST-001-001	0.99932	0.00027	0.99992	0.00031	-60	-1.46
MIX-MET-FAST-003-001	1.00080	0.00028	1.00103	0.00031	-23	-0.55
PU-COMP-INTER-001-001	1.01165	0.00023	1.01228	0.00012	-63	-2.43
PU-MET-FAST-001-001	0.99934	0.00027	1.00084	0.00032	-150	-3.58
PU-MET-FAST-002-001	1.00002	0.00026	1.00029	0.00031	-27	-0.67
PU-MET-FAST-005-001	1.00083	0.00030	1.00191	0.00031	-108	-2.50
PU-MET-FAST-006-001	1.00090	0.00030	1.00261	0.00036	-171	-3.65
PU-MET-FAST-008-001	0.99766	0.00028	0.99870	0.00034	-104	-2.36
PU-MET-FAST-009-001	1.00005	0.00026	0.99933	0.00031	72	1.78
PU-MET-FAST-010-001	0.99988	0.00031	1.00025	0.00031	-37	-0.84
PU-MET-FAST-011-001	1.00053	0.00033	1.00065	0.00039	-12	-0.23
PU-MET-FAST-018-001	0.99945	0.00028	0.99981	0.00031	-36	-0.86
PU-MET-FAST-019-001	1.00046	0.00030	1.00102	0.00031	-56	-1.30
PU-MET-FAST-020-001	0.99824	0.00028	0.99887	0.00031	-63	-1.51
PU-MET-FAST-021-001	1.00419	0.00029	1.00533	0.00033	-114	-2.59
PU-MET-FAST-021-002	0.99350	0.00028	0.99401	0.00033	-51	-1.18
PU-MET-FAST-022-001	0.99849	0.00026	0.99878	0.00033	-29	-0.69
PU-MET-FAST-023-001	0.99986	0.00028	0.99765	0.00031	221	5.29
PU-MET-FAST-024-001	1.00200	0.00029	1.00111	0.00032	89	2.06
PU-MET-FAST-025-001	0.99860	0.00027	0.99933	0.00032	-73	-1.74
PU-MET-FAST-026-001	0.99932	0.00028	0.99986	0.00031	-54	-1.29
PU-SOL-THERM-009-001	1.01472	0.00017	1.01524	0.00014	-52	-2.36
PU-SOL-THERM-009-003	1.01906	0.00049	1.01919	0.00012	-13	-0.26
PU-SOL-THERM-011-005	1.00538	0.00035	1.00599	0.00031	-61	-1.30
PU-SOL-THERM-011-006	0.99418	0.00041	1.00014	0.00028	-596	-12.00
PU-SOL-THERM-018-009	1.00311	0.00032	1.00352	0.00022	-41	-1.06

Model	MCNP-k	MCNP-u	Serpent-k	Serpent-u	delta	delta (sig)
PU-SOL-THERM-021-001	1.00511	0.00041	1.00481	0.00031	30	0.58
PU-SOL-THERM-021-003	1.00416	0.00046	1.00443	0.00033	-27	-0.48
PU-SOL-THERM-034-001	1.00002	0.00040	1.00061	0.00035	-59	-1.11
SPEC-MET-FAST-008-001	0.99507	0.00024	0.99470	0.00026	37	1.05
U233-MET-FAST-001-001	0.99984	0.00026	0.99949	0.00030	35	0.88
U233-MET-FAST-002-001	0.99830	0.00027	0.99920	0.00031	-90	-2.19
U233-MET-FAST-002-002	0.99970	0.00027	1.00064	0.00030	-94	-2.33
U233-MET-FAST-003-001	0.99837	0.00027	0.99892	0.00029	-55	-1.39
U233-MET-FAST-003-002	0.99705	0.00029	0.99889	0.00029	-184	-4.49
U233-MET-FAST-004-001	0.99846	0.00028	0.99891	0.00030	-45	-1.10
U233-MET-FAST-004-002	0.99537	0.00028	0.99616	0.00030	-79	-1.93
U233-MET-FAST-005-001	0.99605	0.00030	0.99577	0.00030	28	0.66
U233-MET-FAST-005-002	0.99479	0.00029	0.99518	0.00030	-39	-0.93
U233-MET-FAST-006-001	0.99912	0.00029	0.99870	0.00032	42	0.97
U233-SOL-INTER-001-001	0.98574	0.00051	0.98525	0.00041	49	0.75
U233-SOL-THERM-001-001	1.00117	0.00046	1.00138	0.00018	-21	-0.43
U233-SOL-THERM-001-002	1.00137	0.00027	1.00126	0.00018	11	0.34
U233-SOL-THERM-001-003	1.00064	0.00027	1.00091	0.00019	-27	-0.82
U233-SOL-THERM-001-004	1.00085	0.00026	1.00066	0.00018	19	0.60
U233-SOL-THERM-001-005	0.99940	0.00027	1.00021	0.00018	-81	-2.50
U233-SOL-THERM-008-001	1.00161	0.00017	1.00157	0.00012	4	0.19