

BENCHMARKING THE COARSE MESH RADIATION TRANSPORT  
(COMET) METHOD

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The Academic Faculty

by

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(COMET) METHOD

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## LIST OF SYMBOLS AND ABBREVIATIONS

$k_{\text{eff}}$	Effective Core Eigenvalue
CA2	Central Fuel Region for Assembly A2
CB1	Central Fuel Region for Assembly B1
CB2	Central Fuel Region for Assembly B2
CBA	Cutback for Assemblies A1 and A2
CBB	Cutback for Assemblies B1 and B2
CBC	Cutback for Assemblies C1, C2, and C3
CC1	Central Fuel Region for Assembly C1
CC2	Central Fuel Region for Assembly C2
CC3	Central Fuel Region for Assembly C3
CDF	Common Data Format
CMCALC	Coarse Mesh Calculation Input File
COMET	Coarse Mesh Transport
CPM	Collision Probability Method
EPR	European Pressurized Reactor
FBL	Fuel Blanket



FSAR	Final Safety Analysis Report
GENDB	Response Function Database Builder Input File
GENRF	Response Function Generation Input File
GUI	Graphical User Interface
HZP	Hot Zero Power
MOX	Mixed Oxide Fuel
NRC	Nuclear Regulatory Commission
PWR	Pressurized Water Reactor
RCCA	Rod Cluster Control Assembly
RCS	Reactor Coolant System

## SUMMARY

This thesis presents a whole-core benchmark of the European Pressurized Reactor (EPR) using multiple transport methods. The core specifications were taken directly from the Final Safety Analysis Report (FSAR) submitted to the Nuclear Regulatory Commission (NRC) and the reactor was modeled in a stylized manner while maintaining full heterogeneity at the pin and assembly level. The geometry and material specifications are given as well as problem-specific cross sections for 2, 4, and 8 energy group calculations. Cross sections were generated using HELIOS, a lattice depletion code based on the Collision Probability Method (CPM). The multi-group cross sections were utilized in the reference calculation, COMET calculation, and response function generation. The reference solution was obtained via an MCNP model identical to the one implemented in COMET. Specific steps towards constructing and running a COMET calculation are outlined. Detailed results including assembly eigenvalues, core eigenvalues, and pin fission densities are presented.

## CHAPTER 1. INTRODUCTION

The European Pressurized Reactor (EPR) is a generation three pressurized water reactor (PWR) designed and developed by Areva NP, Electricité de France (EDF) in France, and Siemens AG in Germany<sup>2,3</sup>. The international name of the EPR - and the name used for submission to the Nuclear Regulatory Commission (NRC) in the United States - is the Evolutionary Power Reactor. The EPR was developed with enhanced safety and economic viability as the primary objectives. In addition to improvements to the Reactor Coolant System (RCS), a complex core design should allow the reactor to operate with a relatively flat flux profile. There are 7 unique assemblies featuring fuel pins of varying enrichments and gadolinium concentrations<sup>3</sup>.

With such high levels of heterogeneity both vertically and horizontally, it is imperative to use robust codes to generate problem-specific cross sections and accurately predict the steady-state behavior of the EPR. Reference solutions for reactors are commonly generated by the widely used Monte Carlo code MCNP for comparison to solutions from novel methods<sup>9</sup>. Unfortunately, full-core Monte Carlo calculations require a massive investment in both time and computational resources. This investment increases for large problems where convergence near the periphery of the core is difficult to achieve.

One method of solving the transport equation without homogenization is the heterogeneous coarse mesh transport (COMET) method. COMET has been shown to accurately solve for the core eigenvalue and power profiles of current light water reactors, heavy water reactors, and high temperature gas reactors<sup>6</sup>. Work by Forget and Rahnema originally illustrated the current COMET method by benchmarking a stylized

C5G7 MOX problem<sup>5</sup>. The study in this thesis shows the method's ability to accurately and efficiently calculate several quantities of interest related to analysis of the EPR.

Two additional nuclear codes are used both to supplement COMET and to provide reference solutions. A general outline of the codes and results generated is as follows:

- HELIOS<sup>8</sup>, a two-dimensional lattice depletion code based on the collision probability method, generates problem-specific nuclear cross sections for use in both MCNP and COMET.
- MCNP is used to model the 1/8<sup>th</sup> core of the EPR as a reference solution.
- MCNP is used to generate response functions for COMET.
- COMET solutions are calculated using the Monte Carlo generated response functions.

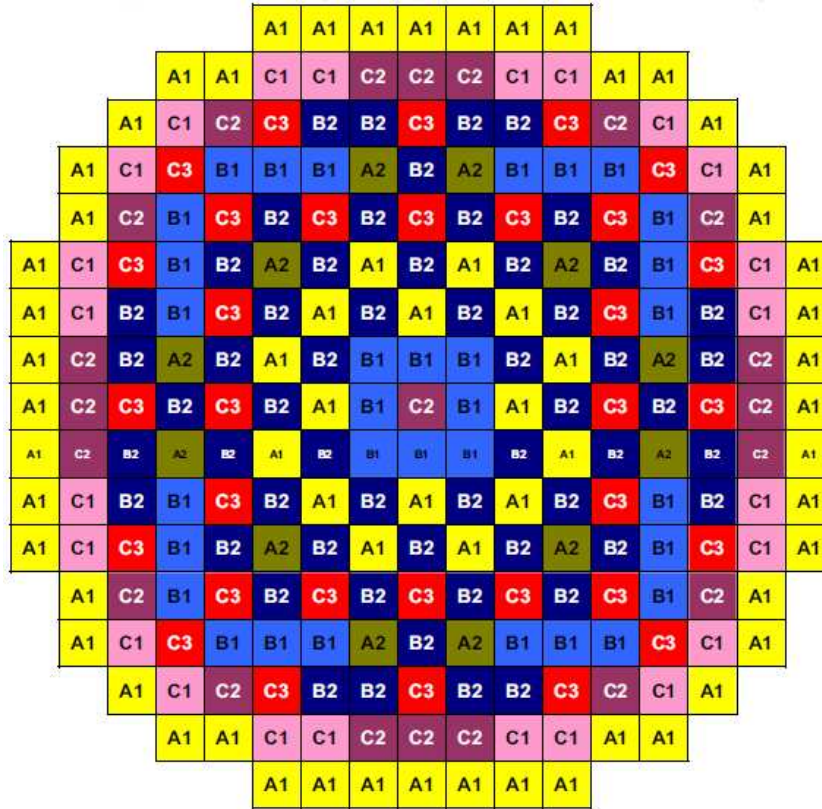
Chapter 2 presents a description of the EPR, including specific parameters and translation into HELIOS, MCNP, and COMET models. A breakdown of the specific use and implementation of each transport code is outlined in Chapter 3. Results from all three models, including core eigenvalues and pin powers, are presented in Chapter 4. A comparison of the results and concluding thoughts are shown in Chapter 5. Formatted problem-specific cross sections are also available in Appendices B-D.

## CHAPTER 2. CORE SPECIFICATION

The EPR benchmark specification is based on the parameters in the FSAR submitted to the NRC. For simplicity, one core configuration was analyzed – hot zero power with all rod cluster control assemblies (RCCAs) out at a theorized  $k_{\text{eff}} = 0.99$ .

### 2.1 Radial Layout

The EPR consists of 241 assemblies arranged in a checkerboard pattern. The assemblies are a typical 17x17 rod array with 265 fuel rods per assembly. Reactivity control is maintained almost entirely by boron in the coolant. Control rods are not inserted in a fresh core. The core layout is shown in Figure 1.



Fuel Type	Description
A1	2.25 wt% central zone enrichment (CZE) with no gadolinia
A2	2.25 wt% CZE with 4 rods at 4 wt% gadolinia
B1	2.70 wt% CZE with 8 rods at 8 wt% and 4 rods at 4 wt% gadolinia
B2	2.70 wt% CZE with 12 rods at 8 wt% and 4 rods at 2 wt% gadolinia
C1	3.25 wt% CZE with 4 rods at 6 wt% and 4 rods at 2 wt% gadolinia
C2	3.25 wt% CZE with 8 rods at 6 wt% and 4 rods at 2 wt% gadolinia
C3	3.25 wt% CZE with 12 rods at 8 wt% and 4 rods at 2 wt% gadolinia

Figure 1. Radial core layout of the EPR<sup>3</sup>.

The specific power, moderator temperature, and fuel temperature were all retrieved from the FSAR submitted to the NRC. The boron concentration for the core was chosen for a fresh core at HZP for a multiplication factor of 0.99. All steady state parameters are presented in Table 1.

TABLE 1. Steady State Parameters

Number of Fuel Assembly	241
Number of Unique Assemblies	7
Specific Power	35.53 W/g
Fuel Temperature	900 K
Moderator Temperature	585.4 K
Cladding Temperature	600 K
Assembly Width/Length	21.4 cm
Boron Concentration in Moderator	1069 ppm

To simplify the layout and decrease the computer runtime, 1/8<sup>th</sup> symmetry was invoked in the cross section generation for assemblies and in the core layout for the eigenvalue calculation. Specular reflective boundary conditions were invoked for the west and east boundaries, while the top, bottom, and radial boundaries were treated as non-re-entrant. The model was also stylized by using square assemblies for moderator on the periphery. This facilitates the use of Cartesian transport codes while keeping some of the effects of the outside moderator and core barrel. Similar simplifications were demonstrated in earlier work by Douglass, Rahnema, and Margulies<sup>7</sup>.

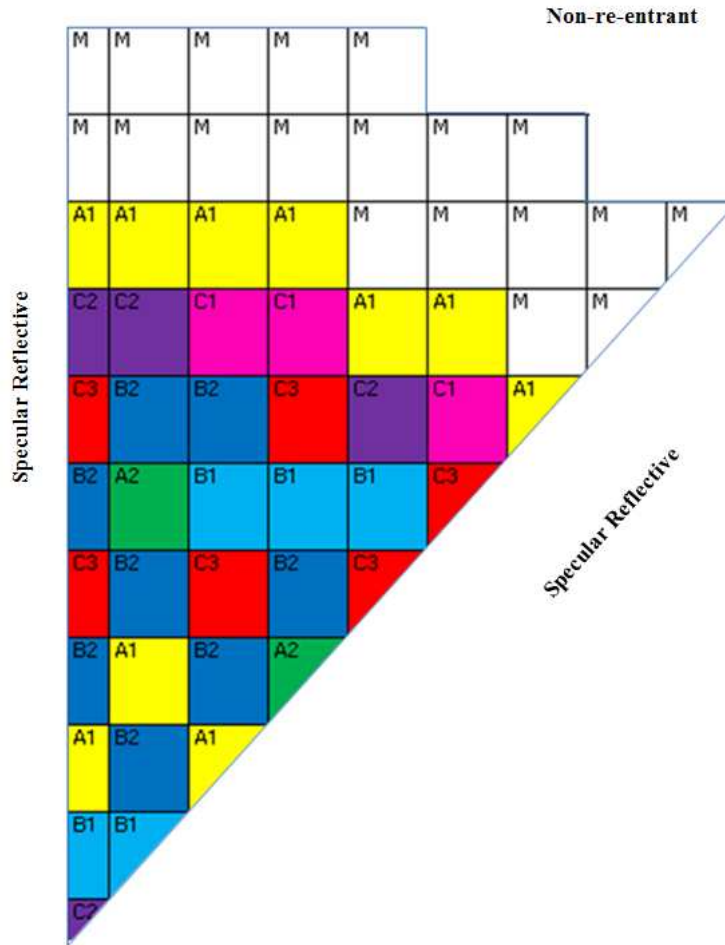


Fig. 2. Model invoking 1/8<sup>th</sup> symmetry with layers of moderator (M) around core.

## 2.2. Axial Layout

Each of the 7 unique assemblies in the core is composed of five axial regions for each fuel rod: a bottom and top blanket region, a bottom and top cutback region, and a central region. Figure 3 illustrates the axial layout of each fuel pin in the EPR.



<u>Height</u>	
419.999 cm	Blanket
399.679 cm	Cutback
384.439 cm	Central
30.480 cm	Cutback
15.240 cm	Blanket
0.000 cm	

Fig. 3. Generic axial layout for each fuel pin.

In order to resolve and illustrate the axial flux, the core was subdivided further into 19 axial regions for the MCNP and COMET models. Figure 4 shows the subdivision of the axial layout.

<u>Height</u>	
419.999 cm	19 - Blanket
399.679 cm	18 - Cutback
384.439 cm	17 - Central
360.842 cm	16 - Central
337.245 cm	15 - Central
313.647 cm	14 - Central
290.050 cm	13 - Central
266.453 cm	12 - Central
242.855 cm	11 - Central
219.258 cm	10 - Central
195.661 cm	9 - Central
172.063 cm	8 - Central
148.466 cm	7 - Central
124.869 cm	6 - Central
101.271 cm	5 - Central
77.675 cm	4 - Central
54.077 cm	3 - Central
30.480 cm	2 - Cutback
15.240 cm	1 - Blanket
0.000 cm	

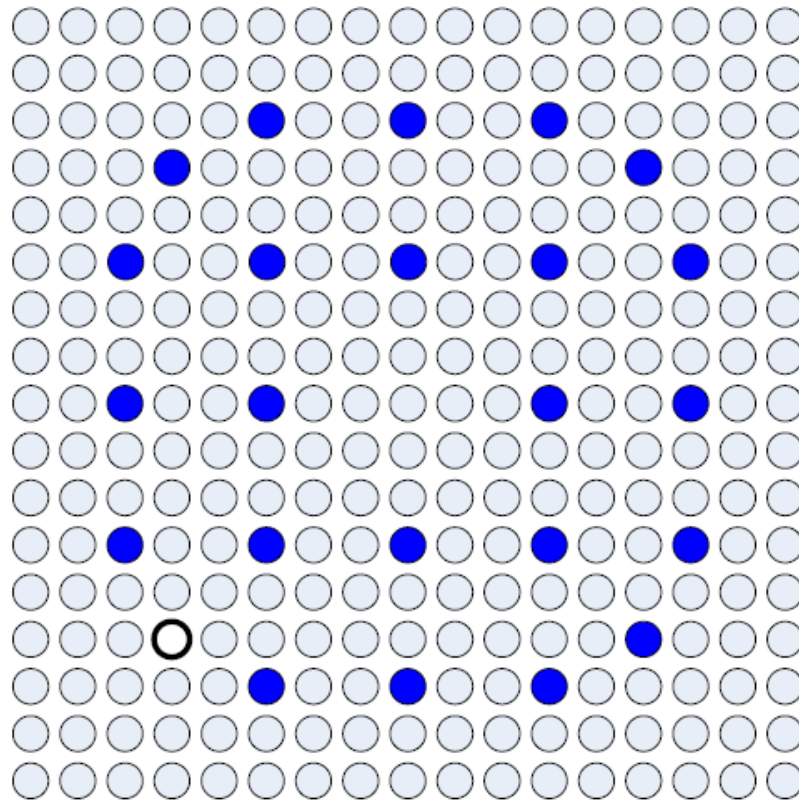
Fig. 4. Axial regions for flux resolution.

A detailed description of the geometry and material composition for each axial layer in each unique assembly is available in Section 2.3.

### 2.3 Assembly Specifications

All 7 unique assemblies are modeled with the same detail for every code used in this study. No spatial homogenization is implemented and each pin cell is modeled to exact specifications.

Pin cells consist of a central fuel pin surrounded by a gap, zirconium cladding, and moderator. Each assembly is a 17x17 square grid of pin cells with 23 guide tubes and one instrument tube. The layout of a generic EPR assembly is shown in Figure 5.



Rod Type	# of Rods	Rod Description
○	265	Fuel Rod
●	23	Guide Tube
○	1	Guide Tube – This tube represents the four symmetric locations in the assembly that may contain incore instrumentation. There is a maximum of two instrumentation guide tubes per assembly.

Figure 5. General EPR Assembly

The seven unique assemblies contain fuel pins with different fuel enrichments (U-235) and burnable absorbers ( $Gd_2O_3$ ). Each fuel rod consists of a blanket region on the top and bottom, a cutback region on the top and bottom, and a central region. The seven assemblies are described in Figures 6-12.

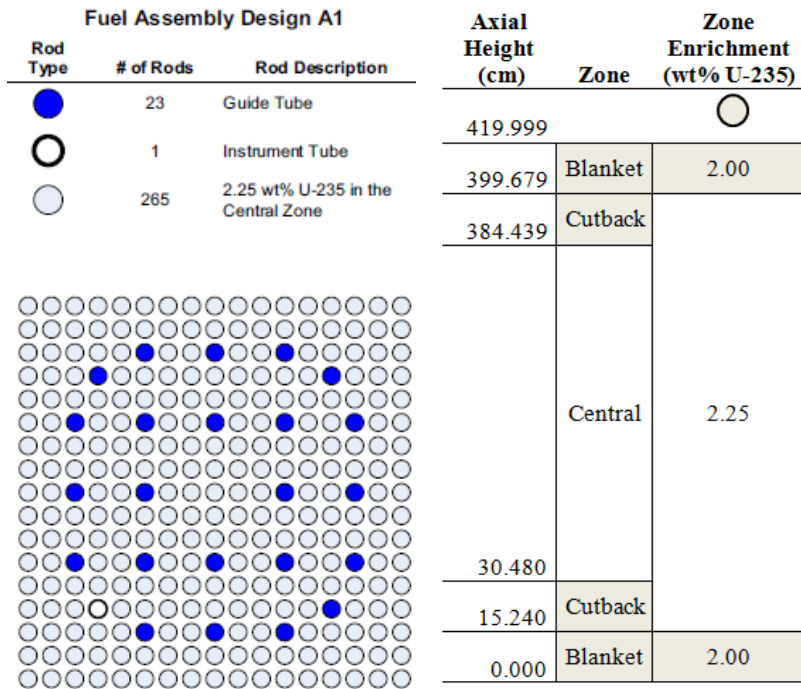


Figure 6. Radial and Axial Layout of Assembly A1

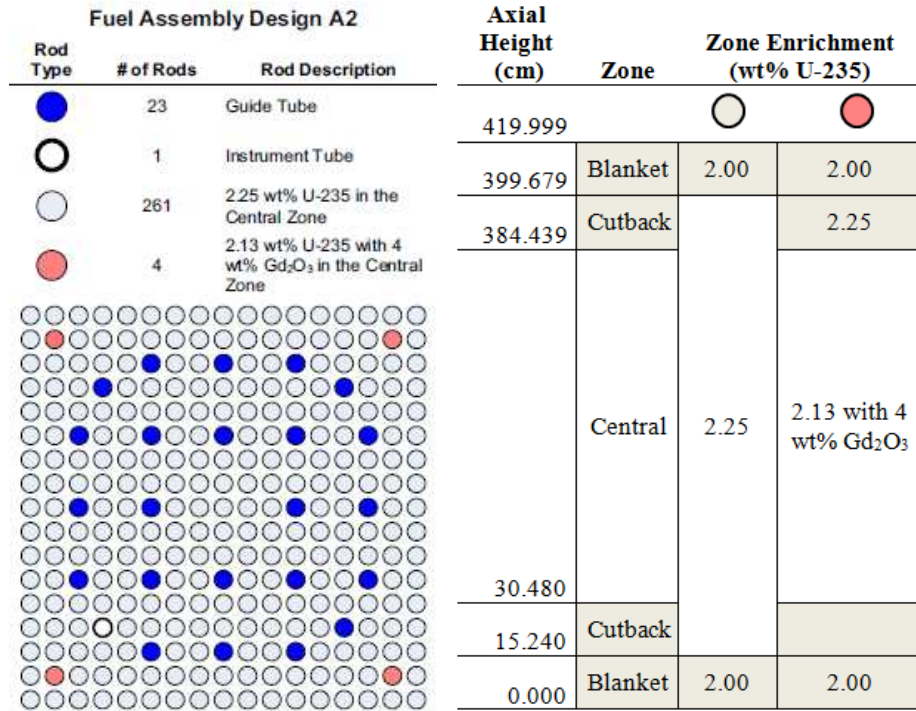


Figure 7. Radial and Axial Layout of Assembly A2

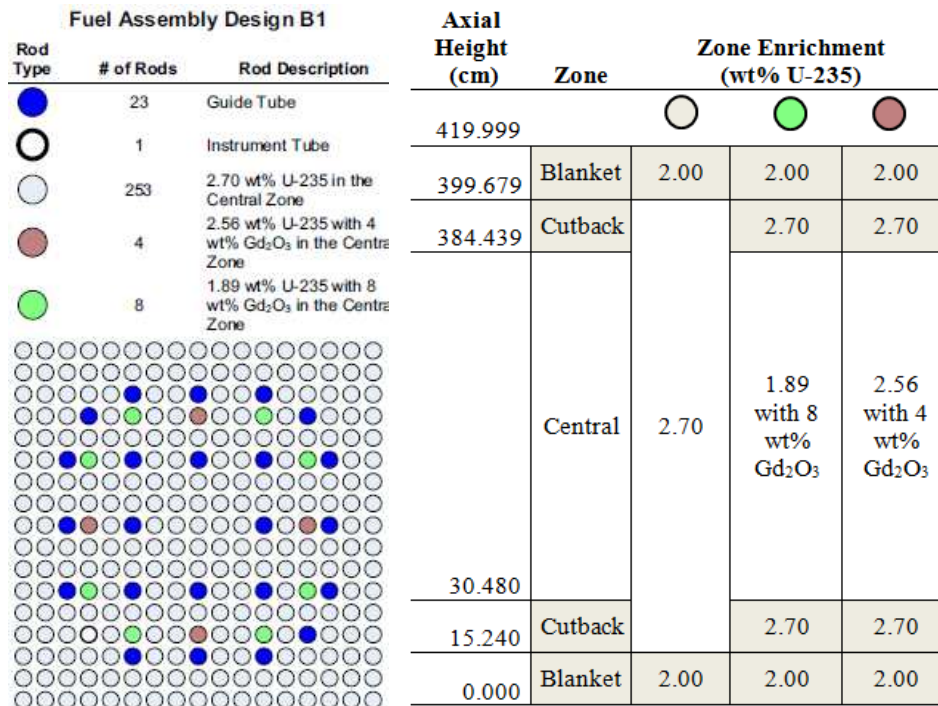


Figure 8. Radial and Axial Layout of Assembly B1

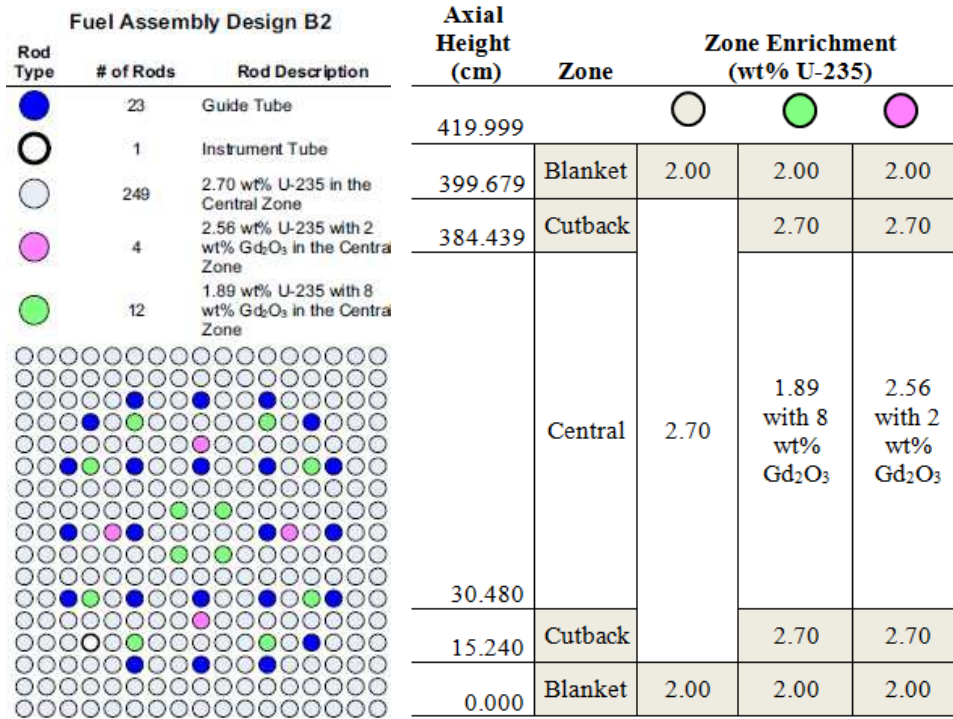


Figure 9. Radial and Axial Layout of Assembly B2

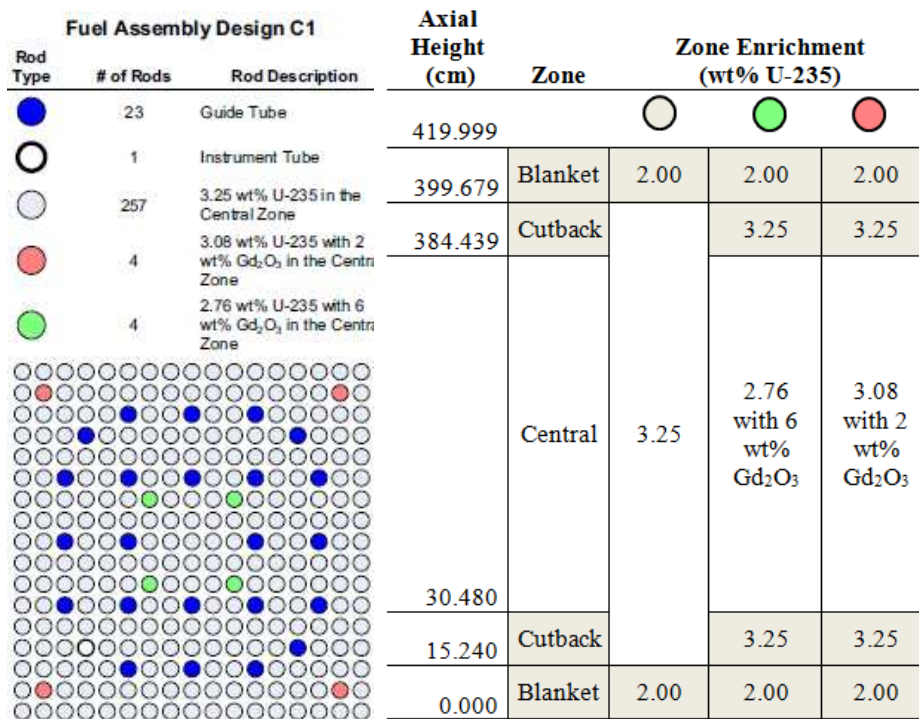


Figure 10. Radial and Axial Layout of Assembly C1

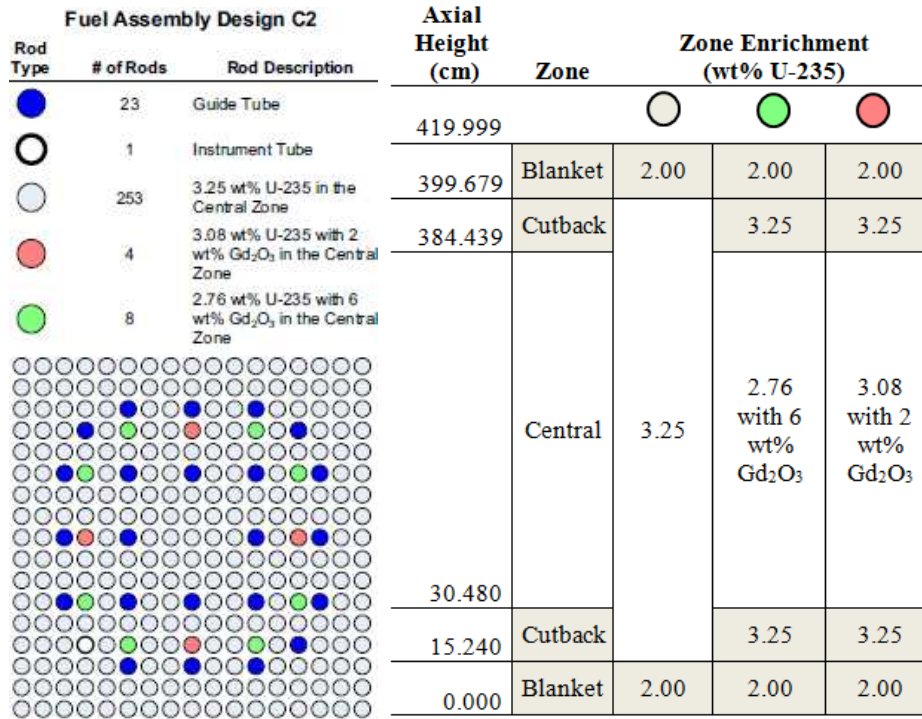


Figure 11. Radial and Axial Layout of Assembly C2

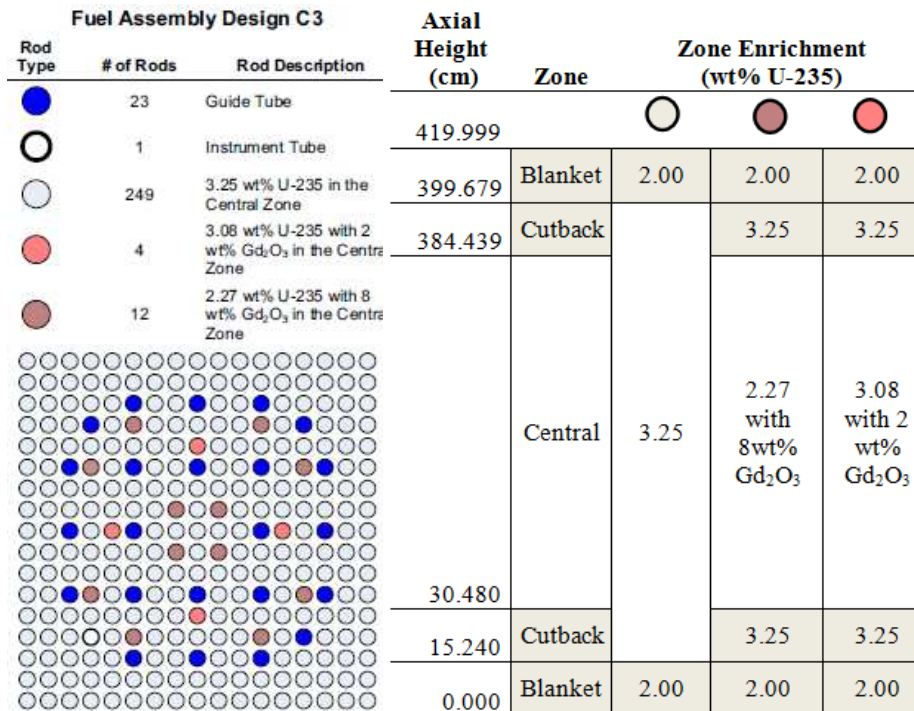


Figure 12. Radial and Axial Layout of Assembly C3

## CHAPTER 3. TRANSPORT MODELS

Three transport codes were used in this study: HELIOS for multi-group cross section generation; MCNP for a reference solution and response function generation; COMET for benchmarking.

### 3.1 HELIOS Model

To facilitate the comparison of COMET and MCNP results, multi-group cross sections were generated using HELIOS. 2, 4, 8 and 47-group cross section libraries were created for each unique assembly. A two-dimensional slice of each assembly at each unique axial layer was modeled in HELIOS. In all, ten models were constructed to accommodate all the axial heterogeneity in the core.

For collapsing to 2, 4, and 8-group libraries, flux-weighted averages were calculated for each material – fuel, cladding, and moderator<sup>8</sup>. All models took advantage of 1/8<sup>th</sup> symmetry to simplify the calculation. Models for all 10 unique axial slices are visualized in Figures 13-19 using the ORION package as part of HELIOS.



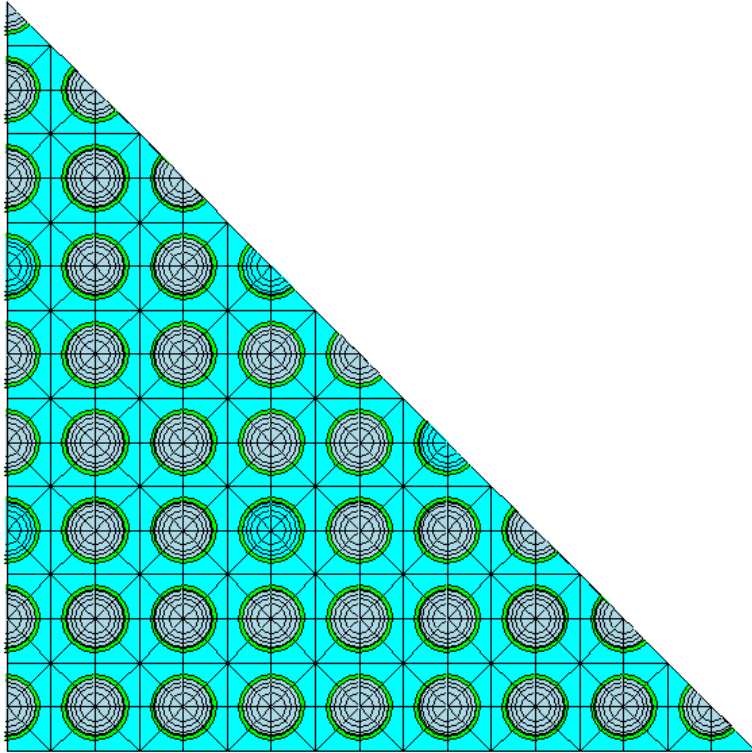


Figure 13. Fuel Blanket, Cutback, and Assembly A1 HELIOS Models

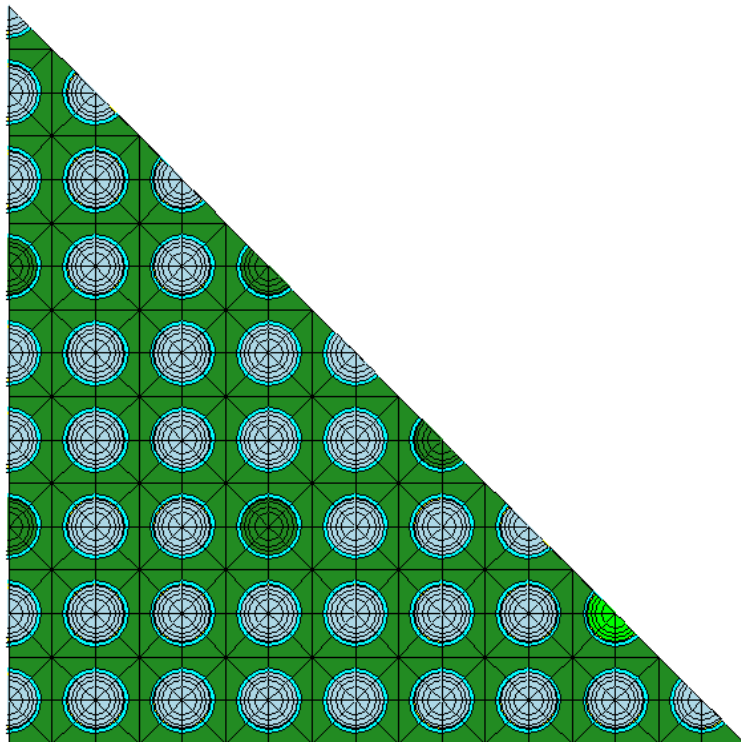


Figure 14. Fuel Assembly A2 HELIOS Model

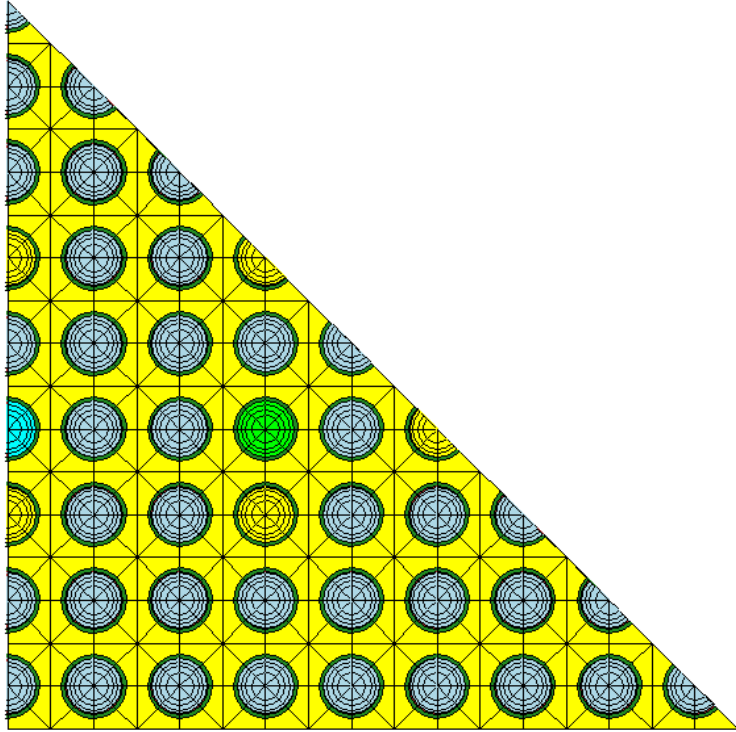


Figure 15. Fuel Assembly B1 HELIOS Model

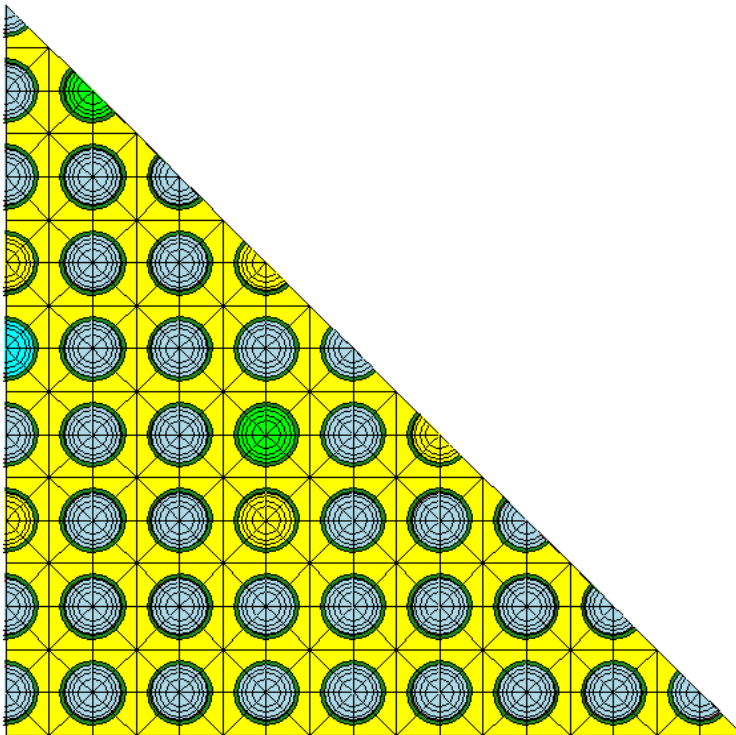


Figure 16. Fuel Assembly B2 HELIOS Model

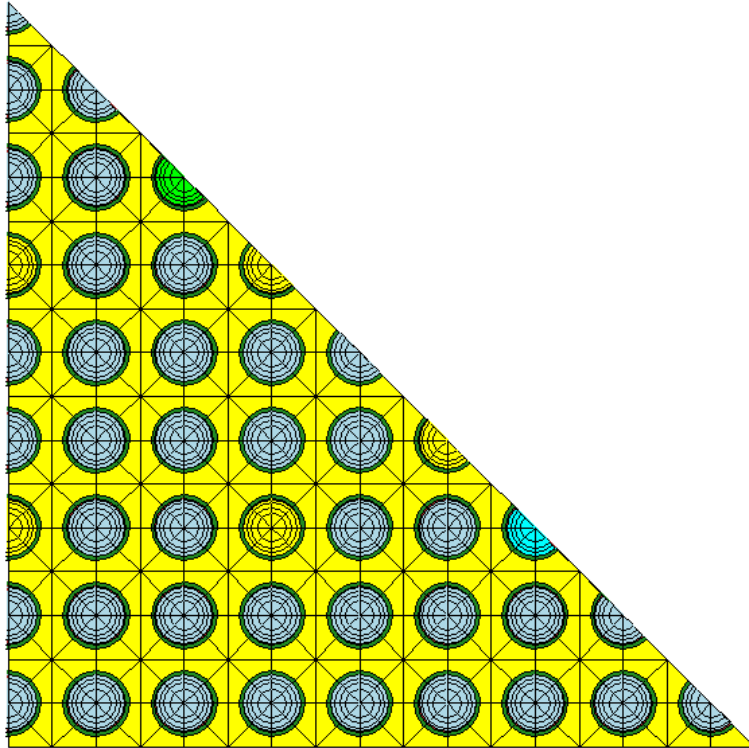


Figure 17. Fuel Assembly C1 HELIOS Model

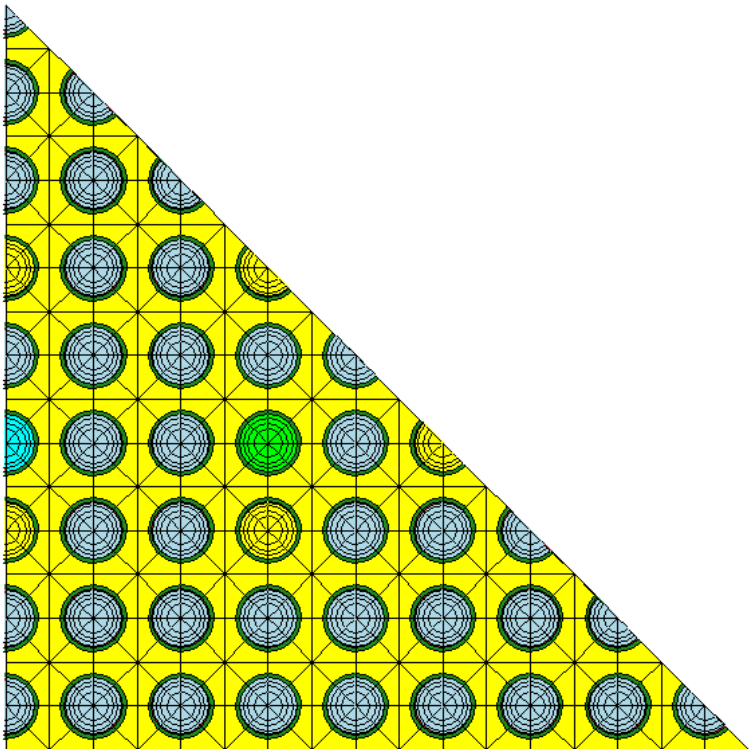


Figure 18. Fuel Assembly C2 HELIOS Model

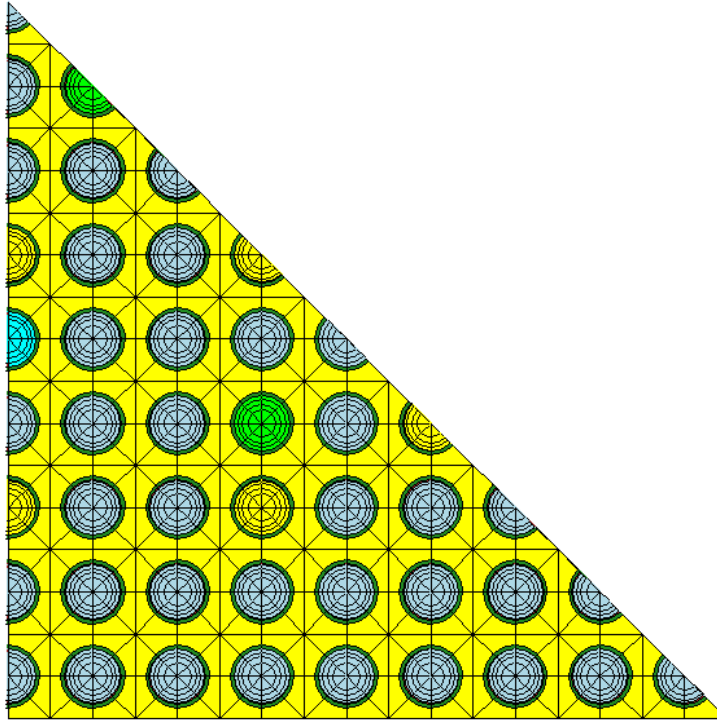


Figure 19. Fuel Assembly C3 HELIOS Model

For each model, the fuel pins were divided into 4 annular regions of equal length and the pins were surrounded by 8 equally spaced moderator meshes. One annular region was used for the cladding as well as the gap in between the fuel and cladding. The 2, 4, and 8-group cross section libraries were collapsed from the initial 47-group library generated for a steady state core with equilibrium xenon and samarium. The results for the eigenvalue calculation in both MCNP and COMET yielded from the 2-group library are presented in section 4. Cross sections are presented in Appendices B-D. Table 2 below shows the 2, 4, and 8 group energy structures.

TABLE 2. Energy Group Bounds for Cross Section Generation

Lower Energy Bound (MeV)	8-Group	4-Group	2-Group
$2.2313 \times 10^{-00}$	1	1	1
$8.2085 \times 10^{-01}$	2		
$9.1188 \times 10^{-03}$	3		
$1.3007 \times 10^{-04}$	4	2	
$3.9279 \times 10^{-06}$	5		
$6.2506 \times 10^{-07}$	6	3	
$1.4572 \times 10^{-07}$	7	4	2
$1.0000 \times 10^{-10}$	8		

### 3.2 MCNP Model

To compare eigenvalues, source convergence was achieved using 2, 4, 8, and 47-group libraries. Due to computational limitations, tallies were only computed using the 2 group cross section library.

As described in Chapter 2, 1/8<sup>th</sup> symmetry was invoked to lower the computation time. The periphery of the core was also stylized with cartesian meshes of moderator rather than the standard core barrel. The MCNP model visualized by the VisEd software is shown in Figure 20.

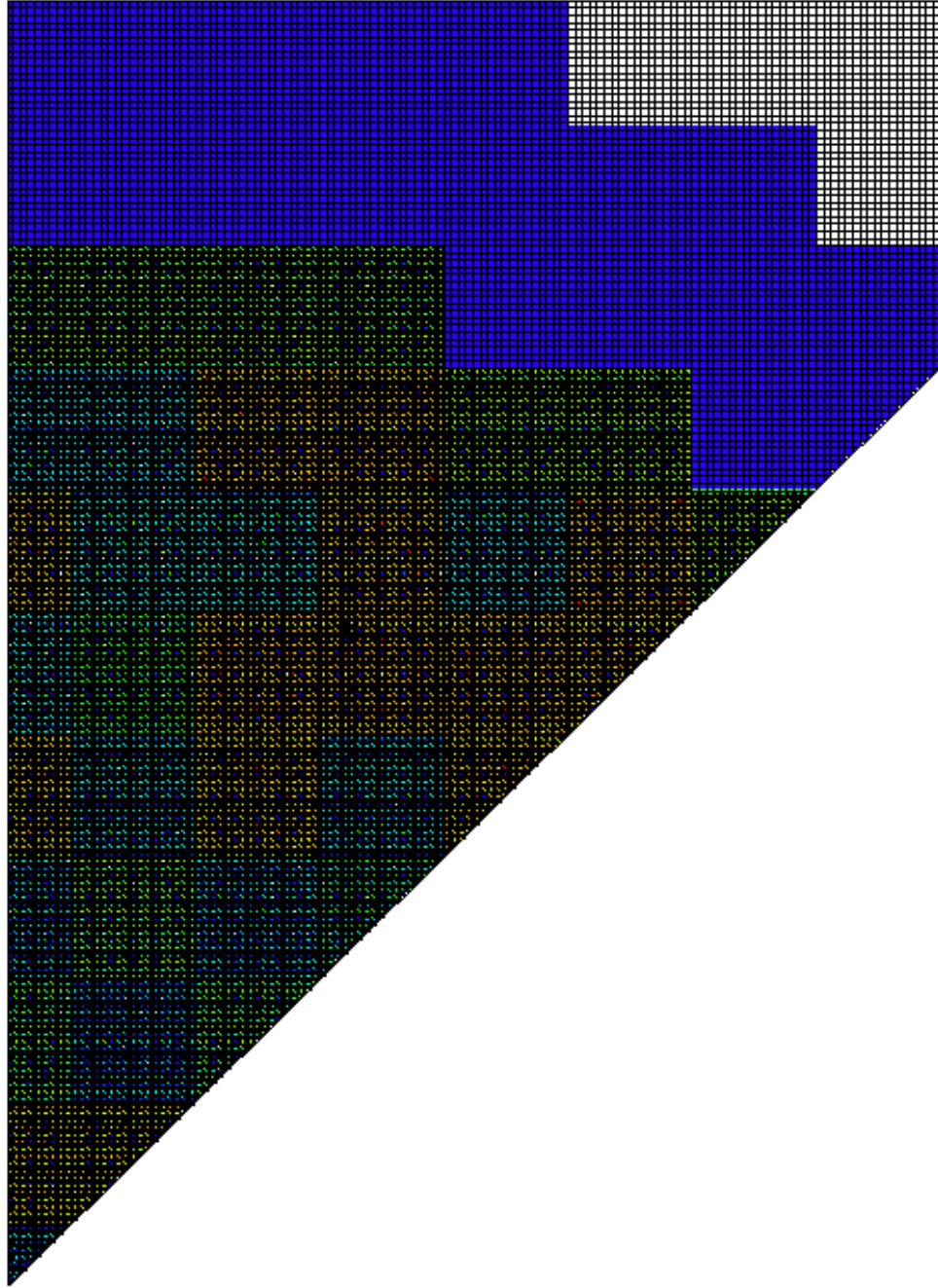


Figure 20. MCNP model of EPR rendered by VisEd.

All MCNP runs were completed with 400,000 histories, 500 inactive cycles and 6000 active cycles.

Due to the computational intensity of each calculation, tallies in MCNP were only conducted for select assemblies in the core. Figure 21 shows the location of the chosen assemblies. Assembly A1 was chosen for its position along the periphery, while assemblies B2 and C2 were chosen because they contain burnable absorber in the fuel.

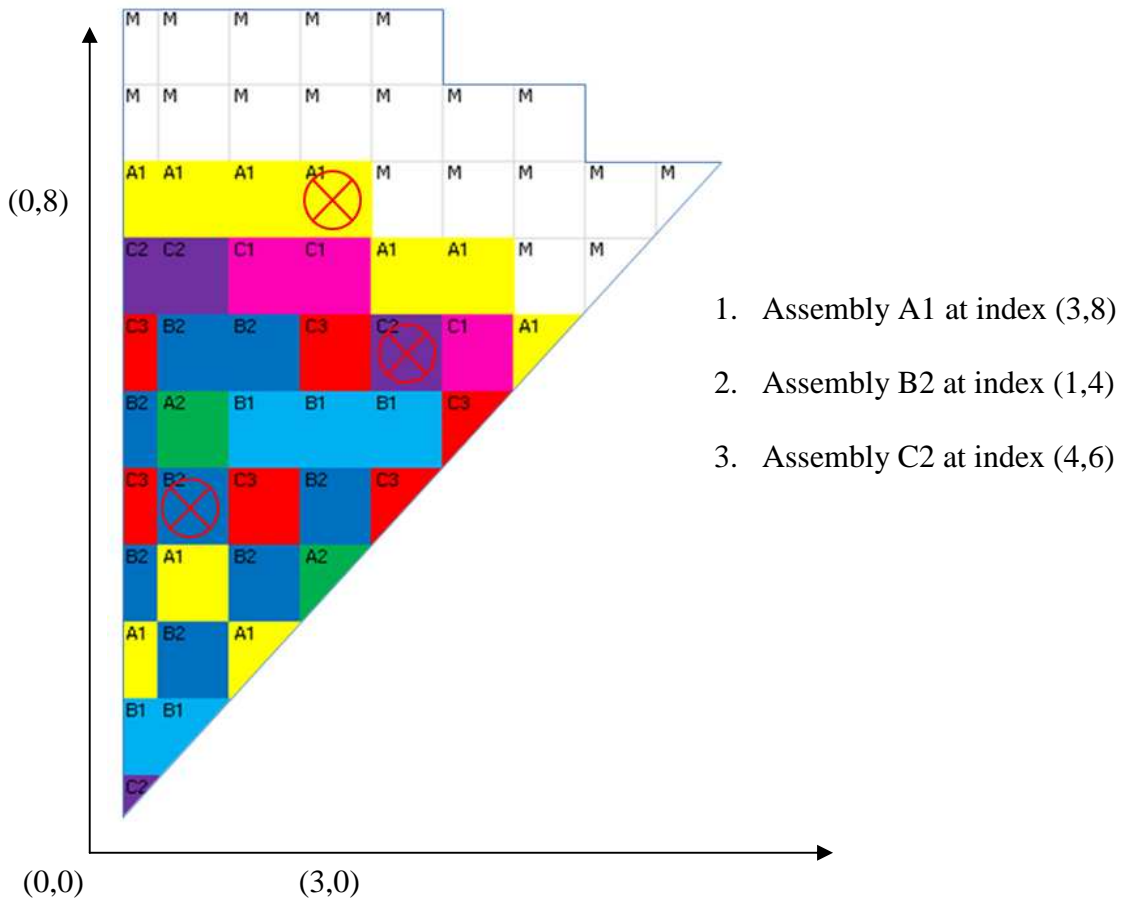


Figure 21. Location of Assembly A1 chosen for pin fission density tallies.

### 3.3 COMET Model

Running a COMET model requires generating response functions for each unique assembly. 15 response function templates were made for the 7 unique assemblies and the moderator surrounding the core. A modified version of MCNP was used to generate the

response functions using 30,000,000 histories for each fixed source problem. Response functions were calculated using a 2-group energy expansion for a grid of three eigenvalues – 0.95, 1.0 and 1.05. Calculations were run using several expansion orders along the spatial and angular variables.

A COMET model consists of the following steps:

1. Creating MCNP template files of each unique assembly (coarse meshes).
2. Creating a response function generation file (GENRF) to create MCNP files from the templates. A file is created for a source expansion on each surface at each discrete energy and each guess on the eigenvalue grid.
3. The MCNP files are run to create response function tallies for the COMET calculation.
4. A database generator file (GENDB) is run to create a CDF database of the response functions.
5. A deterministic core calculation is run (CMCALC) using the response functions generated.

COMET calculations return the eigenvalue, bundle powers, and individual pin powers.

A new graphical user interface (GUI) developed by Andrew Holcomb at Georgia Tech assisted in the generation of the COMET inputs<sup>1</sup>. An example of the GUI being used to generate the core layout in COMET is shown below in Figure 22.



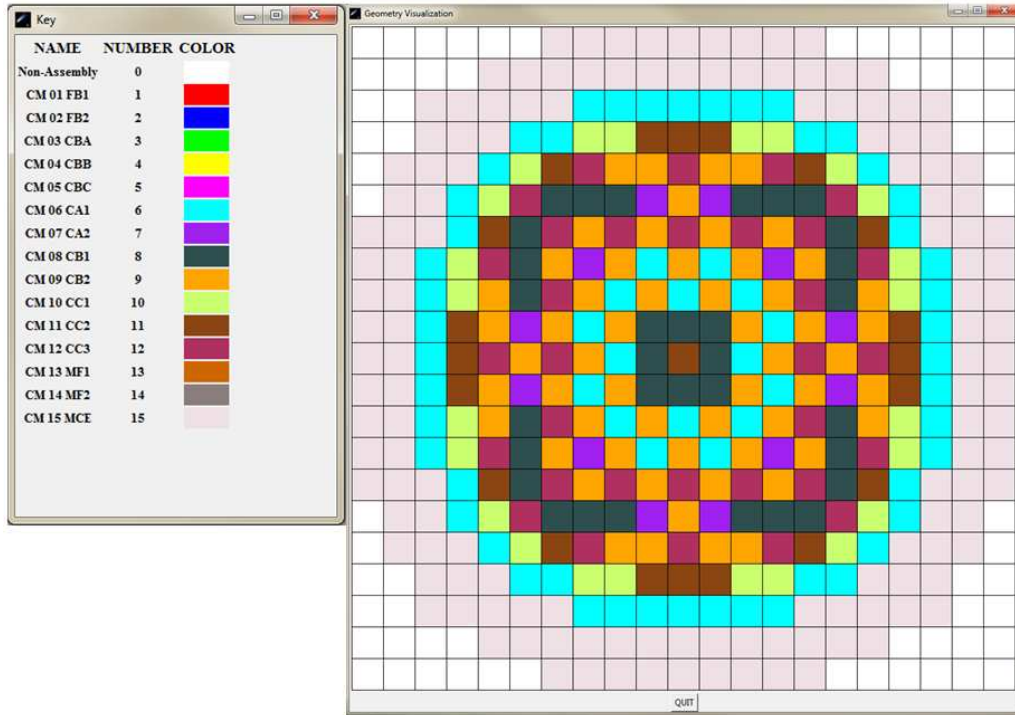


Figure 22. Graphical User Interface (GUI) developed for COMET.

## CHAPTER 4. RESULTS

### 4.1 HELIOS Results

Ten HELIOS models were run to generate cross sections for each axial variant in the entire core. The eigenvalues for each assembly calculation are shown in Table 3.

TABLE 3. HELIOS Eigenvalue Results for Cross-Section Generation

Template/Assembly	$k_{\text{eff}}$	$k_{\text{eff}}$ with equilibrium Xe and Sm
FBL	1.11935	1.08506
CBA	1.15503	1.11928
CBB	1.20665	1.16916
CBC	1.25443	1.21591
CA2	1.10437	1.07165
CB1	1.03805	1.00984
CB2	1.00038	0.97402
CC1	1.15874	1.12594
CC2	1.10542	1.07533
CC3	1.05828	1.03031

Cross section libraries were generated for 2, 4, 8, and 47 group calculations. The libraries are presented in appendices B-D.

### 4.2 MCNP Results

MCNP was used for the reference solution. Eigenvalues were calculated using 2, 4, 8, and 47 group cross section libraries produced by HELIOS. For source convergence, simulations were done using 400,000 particle histories with 500 skipped cycles and 6000

active cycles. Tallies were generated for all 19 axial regions in the model. Core eigenvalues for each multi-group calculation are presented below in Table 4.

TABLE 4. Eigenvalue results for MCNP Calculations

	Eigenvalue	Standard Deviation
2-Group	0.99499	0.00001
4-Group	0.99228	0.00001
8-Group	0.99329	0.00001
47-Group	0.99339	0.00001

Due to the computational intensity of each calculation, tallies were only conducted using the two group library and only in select assemblies. Relative fission densities for assembly A1 at index (3,8) are visualized below in Figure 23.

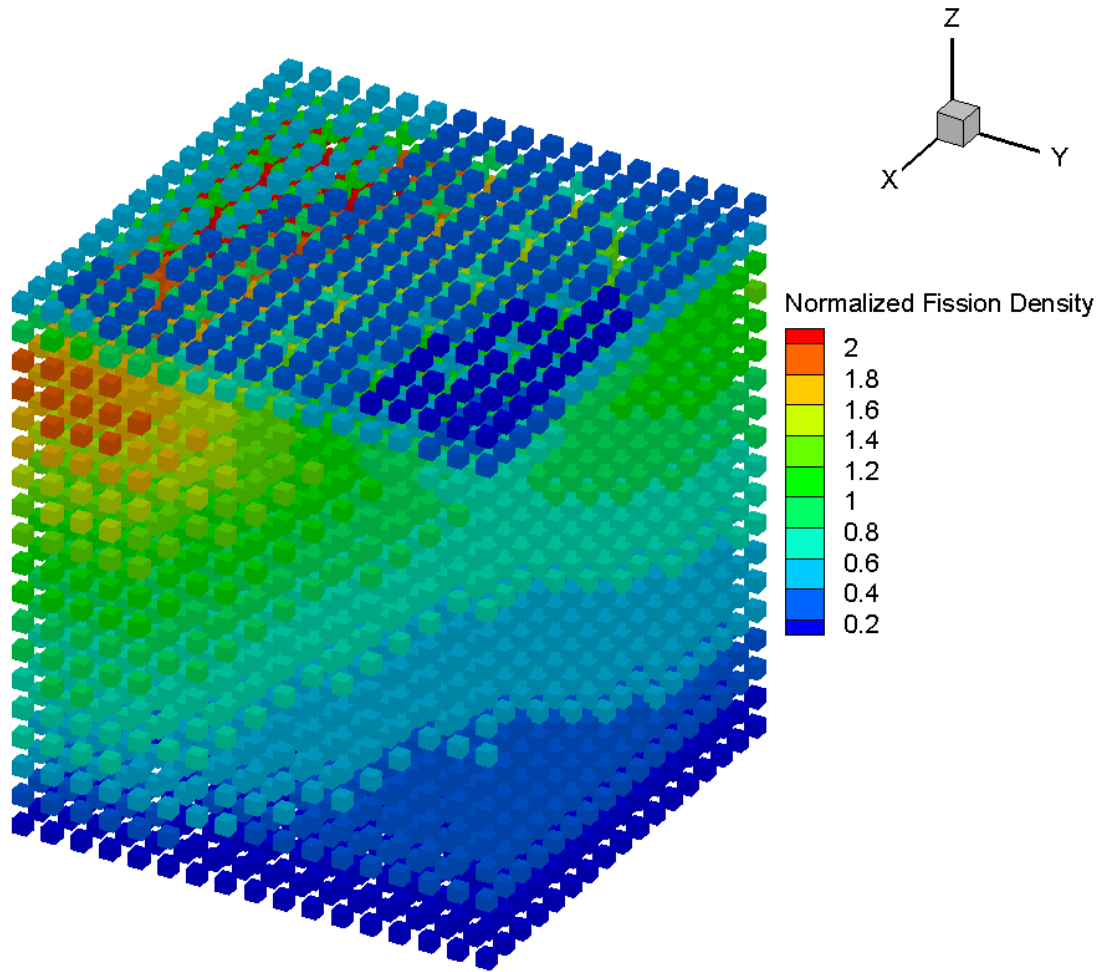


Figure 23. Relative fission densities for Assembly A1 at index (3,8).

#### 4.3 COMET Results

COMET calculations were run over a variant of spatial and angular source expansions. Expansion order was considered for four variables:

- XORD: Spatial expansion in the x-direction
- YORD: Spatial expansion in the y-direction
- UORD: Expansion of the cosine of the polar angle ( $\mu$ )
- PORD: Expansion of the azimuthal angle

Results are shown for each expansion set in the form (XORD, YORD, UORD, PORD).

The relative error (R.E) was calculated as follows:

$$RE_k = \left| \frac{k_{COMET} - k_{reference}}{k_{reference}} \right| \quad (1)$$

Table 5 shows the eigenvalue results using the 2-group cross section library over several expansion sets.

TABLE 5. Eigenvalue results for COMET Calculations

Expansion Order		(0,0,0,0)	(0,0,2,2)	(2,2,0,0)
COMET	Eigenvalue	0.98045	0.97931	0.99823
	S.D.	4.781E-06	4.801E-06	5.528E-06
	Time (min)	8.275	21.118	27.735
MCNP	Eigenvalue	0.99501		
	S.D.	0.00001		
	Time (min)	95419.7		
Comparison	R.E. (pcm)	1463.13	1577.43	323.82
	Speedup	11530.01	4518.27	3440.29
Expansion Order		(2,2,2,2)	(4,4,2,2)	(4,4,4,4)
COMET	Eigenvalue	0.99460	0.99456	0.99456
	S.D.	5.132E-06	5.134E-06	5.134E-06
	Time (min)	146.15	345.61	413.65
MCNP	Eigenvalue	0.99501		
	S.D.	0.00001		
	Time (min)	95419.7		
Comparison	R.E. (pcm)	41.05	44.24	44.24
	Speedup	652.88	276.08	230.67

The average bundle power in each coarse mesh is visualized below in Figure 24 using the expansion order (4,4,4,4). These are the bundle powers for the entire core with 19 vertical meshes in the axial direction.

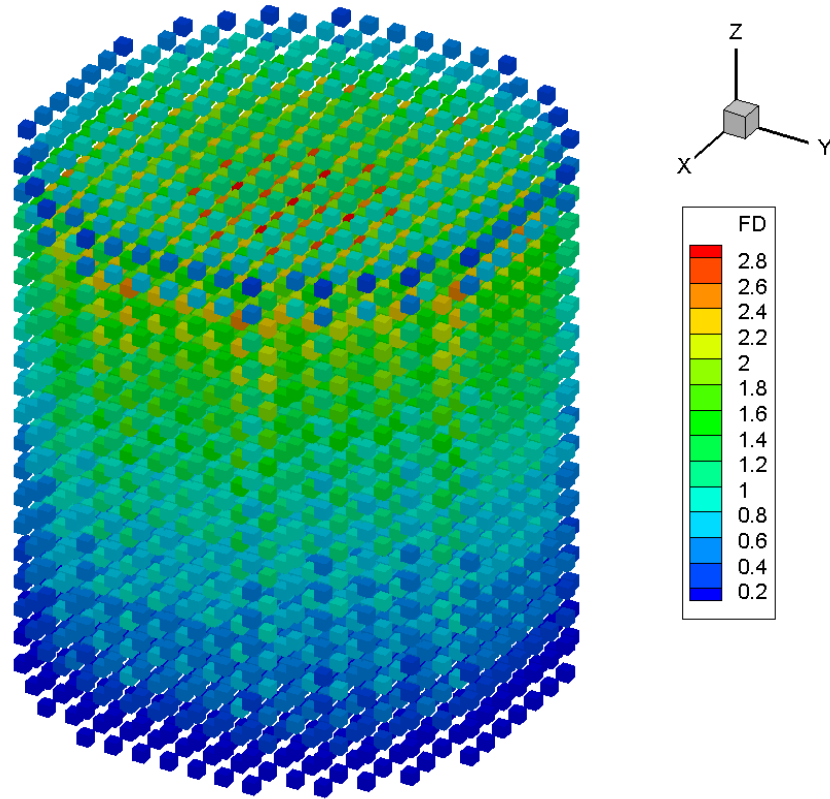


Figure 24. Full core average bundle powers.

Figure 25 shows the average bundle powers and associated percent uncertainties in the core using the expansion set (4,4,4,4). The bold values represent the normalized bundle power and the shaded values represent the percent uncertainty. While COMET produced values for the entire core, only a one-eighth core configuration is shown due to the inherent symmetry of the problem.

<b>7.82E-01</b>	<b>7.87E-01</b>	<b>7.72E-01</b>	<b>6.13E-01</b>			
6.46E-03	6.47E-03	6.53E-03	6.66E-03			
<b>1.15E+00</b>	<b>1.16E+00</b>	<b>1.28E+00</b>	<b>1.18E+00</b>	<b>8.49E-01</b>	<b>5.79E-01</b>	
7.00E-03	6.98E-03	6.84E-03	6.86E-03	6.42E-03	6.64E-03	
<b>1.04E+00</b>	<b>9.49E-01</b>	<b>9.60E-01</b>	<b>1.09E+00</b>	<b>1.14E+00</b>	<b>1.07E+00</b>	<b>6.56E-01</b>
7.16E-03	7.03E-03	7.07E-03	7.18E-03	6.98E-03	6.89E-03	6.57E-03
<b>9.17E-01</b>	<b>1.01E+00</b>	<b>9.49E-01</b>	<b>9.50E-01</b>	<b>9.87E-01</b>	<b>1.06E+00</b>	
6.99E-03	6.38E-03	6.87E-03	6.91E-03	6.96E-03	7.17E-03	
<b>1.05E+00</b>	<b>9.69E-01</b>	<b>1.01E+00</b>	<b>8.87E-01</b>	<b>9.84E-01</b>		
7.12E-03	6.99E-03	7.12E-03	7.02E-03	7.12E-03		
<b>1.11E+00</b>	<b>1.22E+00</b>	<b>1.03E+00</b>	<b>1.04E+00</b>			
6.92E-03	6.29E-03	6.93E-03	6.39E-03			
<b>1.31E+00</b>	<b>1.15E+00</b>	<b>1.24E+00</b>				
6.28E-03	6.89E-03	6.28E-03				
<b>1.20E+00</b>	<b>1.16E+00</b>					
6.86E-03	6.87E-03					
<b>1.34E+00</b>						
6.96E-03						

Figure 25. Eighth-core average bundle powers and associated uncertainties.

The FSAR submitted to the NRC reports the average bundle powers for the same configuration in this study. Those bundle powers are reported in Figure 26 where the bundle power values are in bold and the percent relative difference from the COMET values are in bold. The FSAR states the use of CASMO-3 for cross section generation and PRISM to determine core reactivity and power distributions<sup>2</sup>.

<b>7.78E-01</b>	<b>7.75E-01</b>	<b>7.47E-01</b>	<b>5.85E-01</b>			
0.456	1.569	3.290	4.846			
<b>1.15E+00</b>	<b>1.16E+00</b>	<b>1.23E+00</b>	<b>1.14E+00</b>	<b>8.08E-01</b>	<b>5.58E-01</b>	
0.280	0.332	3.756	3.252	5.083	3.765	
<b>1.10E+00</b>	<b>9.98E-01</b>	<b>1.00E+00</b>	<b>1.11E+00</b>	<b>1.15E+00</b>	<b>1.07E+00</b>	<b>6.17E-01</b>
4.570	4.888	4.312	2.370	0.719	0.056	6.391
<b>9.72E-01</b>	<b>1.05E+00</b>	<b>1.01E+00</b>	<b>1.02E+00</b>	<b>1.05E+00</b>	<b>1.09E+00</b>	
5.665	3.775	6.359	6.947	5.556	2.929	
<b>1.08E+00</b>	<b>9.93E-01</b>	<b>1.06E+00</b>	<b>9.58E-01</b>	<b>1.06E+00</b>		
2.048	2.389	4.710	7.365	7.434		
<b>1.06E+00</b>	<b>1.14E+00</b>	<b>1.02E+00</b>	<b>1.06E+00</b>			
4.751	7.107	1.083	1.791			
<b>1.18E+00</b>	<b>1.07E+00</b>	<b>1.15E+00</b>				
10.950	6.894	8.355				
<b>1.13E+00</b>	<b>1.10E+00</b>					
6.694	5.954					
<b>1.25E+00</b>						
7.070						

Figure 26. Eighth-core average bundle powers reported from FSAR and percent relative difference from COMET results.

The analysis in the FSAR shows an axial peaking consistent with the results in MCNP and COMET.

Pin fission density results are presented in several quantities. The average pin error (PIN AVG), pin root mean square error (PIN RMS), and pin mean relative error



(PIN MRE) are calculated using the following formulas where  $N$  is the number of pins in an assembly,  $RE_i$  is the relative error of the  $i^{th}$  pin,  $FD_i$  is the fission density of the  $i^{th}$  pin, and  $FD_{avg}$  is the average fission density in the assembly. The COMET results are compared with the reference solution in Tables 6, 7, and 8.

$$AVG = \frac{\sum |RE_i|}{N} \quad (2)$$

$$RMS = \sqrt{\frac{\sum RE_i^2}{N}} \quad (3)$$

$$MRE = \frac{\sum |RE_i| \cdot FD_i}{N \cdot FD_{avg}} \quad (4)$$

TABLE 6. Pin Fission Density Results for Assembly A1 at Index (3,8)

Assembly A1			
Expansion Order	(0,0,0,0)	(0,0,2,2)	(2,2,0,0)
PIN AVG (%)	14.12080	14.21375	1.92146
PIN RMS (%)	18.84010	19.03399	2.42894
PIN MRE (%)	12.10963	12.17088	1.86054
PIN MAX (%)	82.07452	84.43197	12.59640
AVG S.D. (%)	0.10380	0.10394	0.11293
MAX S.D. (%)	0.15777	0.15778	0.23087
Expansion Order	(2,2,2,2)	(4,4,2,2)	(4,4,4,4)
PIN AVG (%)	1.89113	1.62908	1.62908
PIN RMS (%)	2.30288	1.90465	1.90465
PIN MRE (%)	1.82640	1.56047	1.56047
PIN MAX (%)	7.84083	7.02944	7.02944
AVG S.D. (%)	0.11252	0.11320	0.11320
MAX S.D. (%)	0.22493	0.22943	0.22943

TABLE 7. Pin Fission Density Results for Assembly B2 at Index (1,4)

Assembly B2			
Expansion Order	(0,0,0,0)	(0,0,2,2)	(2,2,0,0)
PIN AVG (%)	2.051	2.088	2.046
PIN RMS (%)	3.207	3.221	3.263
PIN MRE (%)	1.757	1.797	1.706
PIN MAX (%)	12.968	13.031	13.496
AVG S.D. (%)	0.110	0.110	0.112
MAX S.D. (%)	0.154	0.154	0.154
Expansion Order	(2,2,2,2)	(4,4,2,2)	(4,4,4,4)
PIN AVG (%)	5.440	5.449	1.386
PIN RMS (%)	6.806	6.815	2.875
PIN MRE (%)	5.280	5.290	1.030
PIN MAX (%)	17.649	17.554	12.600
AVG S.D. (%)	0.111	0.111	0.109
MAX S.D. (%)	0.154	0.155	0.154

TABLE 8. Pin Fission Density Results for Assembly C2 at Index (4,6)

Assembly C2			
Expansion Order	(0,0,0,0)	(0,0,2,2)	(2,2,0,0)
PIN AVG (%)	3.851	4.024	2.995
PIN RMS (%)	4.702	4.875	4.503
PIN MRE (%)	3.757	3.937	2.830
PIN MAX (%)	14.105	14.096	18.570
AVG S.D. (%)	0.112	0.112	0.112
MAX S.D. (%)	0.158	0.158	0.159
Expansion Order	(2,2,2,2)	(4,4,2,2)	(4,4,4,4)
PIN AVG (%)	2.736	2.783	2.786
PIN RMS (%)	4.386	4.440	4.040
PIN MRE (%)	2.568	2.618	2.626
PIN MAX (%)	17.040	16.409	15.854
AVG S.D. (%)	0.112	0.113	0.113
MAX S.D. (%)	0.160	0.160	0.160

While the average error and mean relative error show excellent agreement, the maximum error suggests a statistical limitation in the Monte Carlo calculation. The large problem size led to poor statistical convergence along the periphery with the given parameters.

Figure 27 shows the whole-core model with each individual normalized pin fission density explicitly rendered in TecPlot. The TecPlot layout file was generated using the GUI output processor developed by Andrew Holcomb<sup>1</sup>.

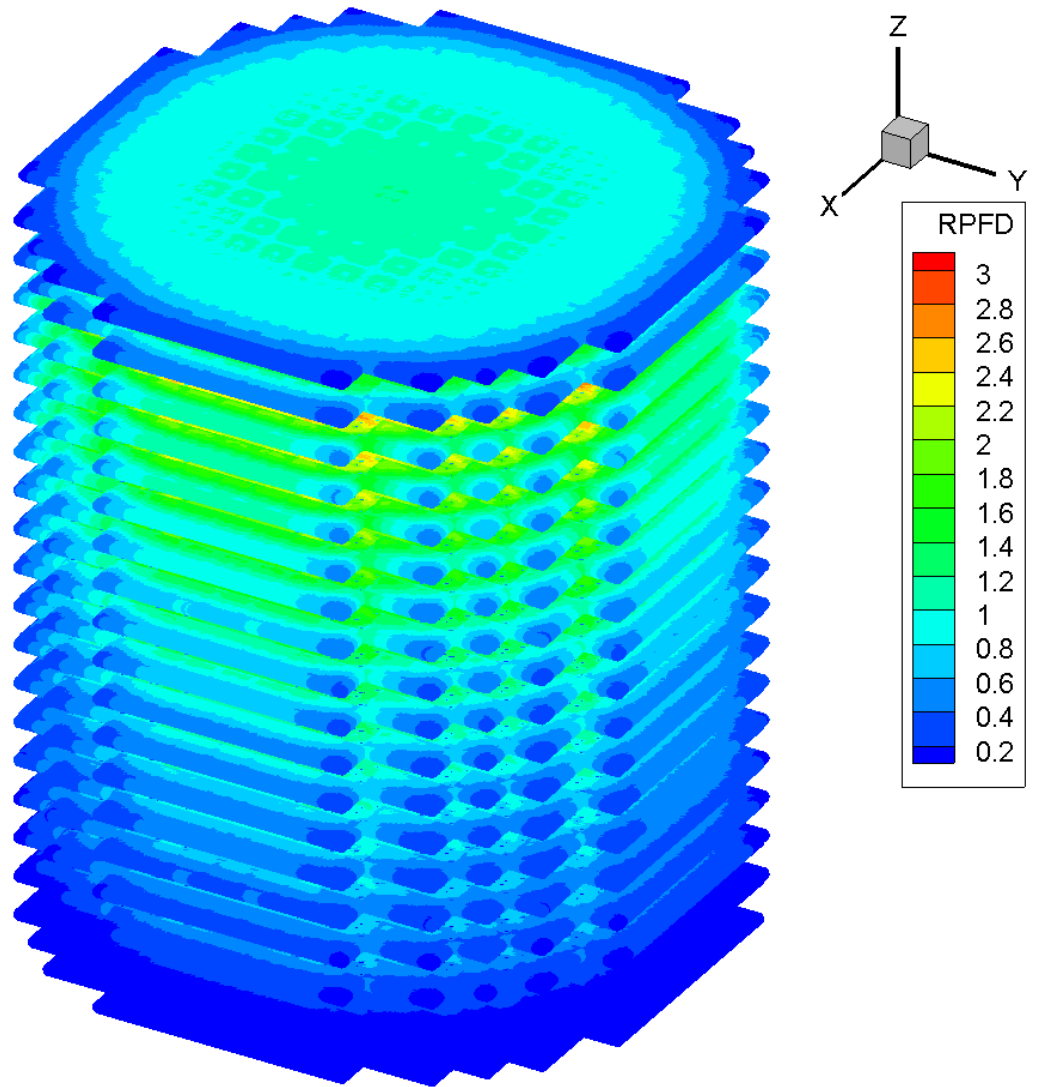


Figure 27. Whole-core pin fission densities rendered in TecPlot.

Both the MCNP results and COMET results show distinct axial peaking at the top of core resulting from the curious choice to make the top fuel blanket longer than the bottom fuel blanket.

## CHAPTER 5. CONCLUSION

In this study, a robust whole-core model of the EPR was developed using a host of different transport codes and methods. COMET was shown to provide highly accurate and efficient solutions for complex core configurations regardless of problem size. While simplifications were made to construct a stylized model, they did not degrade the quality or relevance of the results in this study. The cross sections generated in this study are presented in a portable manner to facilitate benchmarking with other transport codes.

This model could be extended further by explicitly including the core barrel and the moderator around the core. Further work could also explore core configurations with full and partial control rod insertion to calculate control rod worth. A possible avenue to investigate is the use of MoCS-Gen for cross section generation and energy condensation to generate more accurate cross sections inclusive of the core environment effect.

This study also served as an enlightening exercise in the overall usability of COMET and its accessibility for new users to use in modeling highly heterogeneous, complex core configurations. The development of a GUI facilitates the interface for new users to make COMET inputs. More work will need to be done to overhaul the infrastructure of COMET however if and when additional modules such as burnup are integrated.

## APPENDIX A: CROSS SECTION LIBRARY FORMAT

Cross sections were generated for each unique cross-sectional area of each assembly. This resulted in ten different sets of cross sections for fuel, cladding, and moderator. The following format is used to present the cross sections:

$$\left\{ \left\{ \sigma_{cg} \right\}_{g=1}^G, \left\{ \sigma_{fg} \right\}_{g=1}^G, \left\{ \nu_g \right\}_{g=1}^G, \left\{ \chi_g \right\}_{g=1}^G, \left\{ \left\{ \left\{ \sigma_{sn}^{g' \rightarrow g} \right\}_{g'=1}^G \right\}_{g=1}^G \right\}_{n=0}^N \right.$$

The total number of energy groups is represented by  $G$ ;  $\sigma_{cg}$  is the capture cross section for group  $g$ ;  $\sigma_{fg}$  is the fission cross section for group  $g$ ;  $\nu_g$  is the fission yield (neutrons per fission) in group  $g$ ;  $\chi_g$  is the portion of the fission spectrum distribution corresponding to group  $g$ ;  $\sigma_{sn}^{g' \rightarrow g}$  is the  $n^{th}$  Legendre moment for the group  $g'$  to  $g$  scattering cross section.

## APPENDIX B: 2-GROUP CROSS SECTION LIBRARY

### Fuel Blanket and Assembly A1 Cross Sections

---

Moderator

6.3581E-04	2.2814E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.8029E-01	1.6593E-03	2.6905E-02	1.7243E+00
3.4594E-01	1.0418E-03	7.9635E-03	4.9582E-01		

Cladding

1.8748E-03	4.7378E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.1409E-01	6.4907E-04	3.1247E-04	2.7545E-01
3.7557E-02	-7.8955E-05	-7.2492E-05	2.5718E-03		

UO2 Fuel - 2.00% U-235

2.6851E-02	1.9560E-01	6.5512E-03	1.3132E-01	2.5772E+00	2.4338E+00
1.0000E+00	0.0000E+00	3.9733E-01	1.4775E-03	8.8189E-04	4.0567E-01
4.4199E-02	-1.3885E-04	-2.0433E-04	8.8415E-03		

### Fuel Cutback for Assembly A1 and A2 Cross Sections

---

Moderator

6.2834E-04	2.2638E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.7876E-01	1.7560E-03	2.6453E-02	1.7163E+00
3.4488E-01	1.1032E-03	7.8239E-03	4.9616E-01		

Cladding

1.8692E-03	4.6974E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.1407E-01	6.8940E-04	3.0609E-04	2.7539E-01
3.7740E-02	-8.3831E-05	-7.1012E-05	2.5780E-03		

UO2 Fuel - 2.25% U-235

2.7343E-02	2.1329E-01	7.0013E-03	1.4606E-01	2.5691E+00	2.4338E+00
1.0000E+00	0.0000E+00	3.9696E-01	1.5747E-03	8.6333E-04	4.0574E-01
4.4368E-02	-1.4745E-04	-2.0007E-04	8.8563E-03		

### Fuel Cutback for Assembly B1 and B2 Cross Sections

---

Moderator

6.1656E-04	2.2350E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.7637E-01	1.9187E-03	2.5735E-02	1.7032E+00
3.4323E-01	1.2064E-03	7.6020E-03	4.9670E-01		

Cladding

1.8608E-03	4.6312E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.1404E-01	7.5775E-04	2.9594E-04	2.7530E-01
3.8024E-02	-9.2091E-05	-6.8661E-05	2.5885E-03		

UO2 Fuel - 2.7% U-235

2.8228E-02	2.4429E-01	7.7889E-03	1.7192E-01	2.5572E+00	2.4338E+00
1.0000E+00	0.0000E+00	3.9636E-01	1.7415E-03	8.3374E-04	4.0591E-01
4.4634E-02	-1.6218E-04	-1.9327E-04	8.8815E-03		

### Fuel Cutback for Assembly C1, C2, and C3 Cross Sections

---

Moderator

6.0427E-04	2.2041E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.7395E-01	2.1004E-03	2.4981E-02	1.6891E+00
3.4155E-01	1.3218E-03	7.3689E-03	4.9728E-01		

Cladding

1.8525E-03	4.5599E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.1401E-01	8.3464E-04	2.8524E-04	2.7519E-01
3.8313E-02	-1.0138E-04	-6.6179E-05	2.6002E-03		

UO2 Fuel - 3.25% U-235

2.9304E-02	2.8093E-01	8.7187E-03	2.0254E-01	2.5460E+00	2.4338E+00
1.0000E+00	0.0000E+00	3.9580E-01	1.9326E-03	8.0255E-04	4.0615E-01
4.4916E-02	-1.7902E-04	-1.8609E-04	8.9098E-03		

Central Region for Assembly A2

---

Moderator

6.3170E-04	2.2571E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.7990E-01	1.8051E-03	2.6627E-02	1.7132E+00
3.4565E-01	1.1344E-03	7.8760E-03	4.9627E-01		

Cladding

1.8752E-03	4.6825E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.1415E-01	7.1079E-04	3.0808E-04	2.7537E-01
3.7609E-02	-8.6414E-05	-7.1476E-05	2.5811E-03		

UO2 Fuel - 2.25% U-235

2.7462E-02	2.1268E-01	7.0174E-03	1.4559E-01	2.5686E+00	2.4338E+00
1.0000E+00	0.0000E+00	3.9721E-01	1.6178E-03	8.6935E-04	4.0566E-01
4.4264E-02	-1.5122E-04	-2.0148E-04	8.8609E-03		

UO2 Fuel - 2.13% U-235 and 4% Gd<sub>2</sub>O<sub>3</sub>

4.3065E-02	3.8855E+00	6.3173E-03	7.3799E-02	2.5693E+00	2.4338E+00
1.0000E+00	0.0000E+00	2.5909E-01	2.6957E-03	2.1261E-04	2.6150E-01
3.3446E-02	-3.7187E-04	-4.5221E-05	2.2322E-03		

Central Region for Assembly B1

---

Moderator

6.2620E-04	2.2061E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.8030E-01	2.1268E-03	2.6224E-02	1.6900E+00
3.4585E-01	1.3387E-03	7.7468E-03	4.9719E-01		

Cladding

1.8808E-03	4.5701E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.1436E-01	8.4446E-04	3.0099E-04	2.7518E-01
3.7602E-02	-1.0256E-04	-6.9833E-05	2.6010E-03		

UO2 Fuel - 2.7% U-235

2.8559E-02	2.4147E-01	7.8437E-03	1.6972E-01	2.5559E+00	2.4338E+00
1.0000E+00	0.0000E+00	3.9717E-01	1.9092E-03	8.4833E-04	4.0559E-01
4.4318E-02	-1.7676E-04	-1.9672E-04	8.8993E-03		

UO2 Fuel - 1.89% U-235 and 8% Gd<sub>2</sub>O<sub>3</sub>

5.6468E-02	5.7762E+00	5.5778E-03	5.7417E-02	2.5798E+00	2.4338E+00
1.0000E+00	0.0000E+00	2.6495E-01	3.4720E-03	2.0759E-04	2.7452E-01
3.3871E-02	-4.4953E-04	-4.2492E-05	2.4144E-03		

UO2 Fuel - 2.56% U-235 and 4% Gd<sub>2</sub>O<sub>3</sub>

4.5166E-02	3.9135E+00	7.1728E-03	8.8552E-02	2.5559E+00	2.4338E+00
1.0000E+00	0.0000E+00	2.5957E-01	2.7366E-03	2.1463E-04	2.6193E-01
3.3418E-02	-3.7753E-04	-4.5655E-05	2.2402E-03		

Central Region for Assembly B2

---

Moderator

6.2844E-04	2.1992E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.8118E-01	2.1768E-03	2.6330E-02	1.6869E+00



3.4644E-01	1.3705E-03	7.7781E-03	4.9731E-01			
Cladding						
1.8853E-03	4.5550E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	3.1442E-01	8.6600E-04	3.0197E-04	2.7515E-01	
3.7506E-02	-1.0516E-04	-7.0062E-05	2.6041E-03			
UO2 Fuel - 2.7% U-235						
2.8634E-02	2.4082E-01	7.8562E-03	1.6920E-01	2.5557E+00	2.4338E+00	
1.0000E+00	0.0000E+00	3.9732E-01	1.9498E-03	8.5089E-04	4.0552E-01	
4.4253E-02	-1.8027E-04	-1.9734E-04	8.9035E-03			
UO2 Fuel - 1.89% U-235 and 8% Gd <sub>2</sub> O <sub>3</sub>						
5.6347E-02	5.5823E+00	5.5757E-03	5.6936E-02	2.5798E+00	2.4338E+00	
1.0000E+00	0.0000E+00	2.6490E-01	3.5538E-03	2.0755E-04	2.7317E-01	
3.3823E-02	-4.5997E-04	-4.2486E-05	2.4187E-03			
UO2 Fuel - 2.56% U-235 and 2% Gd <sub>2</sub> O <sub>3</sub>						
3.7722E-02	2.6706E+00	7.4355E-03	9.7604E-02	2.5541E+00	2.4338E+00	
1.0000E+00	0.0000E+00	2.5710E-01	2.1963E-03	2.2154E-04	2.5323E-01	
3.2957E-02	-3.1258E-04	-4.8044E-05	2.1074E-03			

---

Central Region for Assembly C1

---

Moderator						
6.1004E-04	2.1887E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	5.7616E-01	2.2123E-03	2.5287E-02	1.6821E+00	
3.4303E-01	1.3929E-03	7.4601E-03	4.9754E-01			
Cladding						
1.8636E-03	4.5264E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	3.1418E-01	8.8287E-04	2.8863E-04	2.7512E-01	
3.8074E-02	-1.0720E-04	-6.6965E-05	2.6071E-03			
UO2 Fuel - 3.25% U-235						
2.9519E-02	2.7911E-01	8.7597E-03	2.0108E-01	2.5451E+00	2.4338E+00	
1.0000E+00	0.0000E+00	3.9622E-01	2.0282E-03	8.1219E-04	4.0597E-01	
4.4722E-02	-1.8735E-04	-1.8835E-04	8.9199E-03			
UO2 Fuel - 2.76% U-235 and 6% Gd <sub>2</sub> O <sub>3</sub>						
5.0849E-02	4.7172E+00	7.1713E-03	8.8056E-02	2.5530E+00	2.4338E+00	
1.0000E+00	0.0000E+00	2.6122E-01	3.2427E-03	2.0072E-04	2.6785E-01	
3.4050E-02	-4.3345E-04	-4.1888E-05	2.3470E-03			
UO2 Fuel - 3.08% U-235 and 2% Gd <sub>2</sub> O <sub>3</sub>						
3.7211E-02	2.6196E+00	8.1861E-03	1.1660E-01	2.5465E+00	2.4338E+00	
1.0000E+00	0.0000E+00	2.5524E-01	2.2512E-03	2.0449E-04	2.5337E-01	
3.3748E-02	-3.2041E-04	-4.4347E-05	2.1162E-03			

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Central Region for Assembly C2

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Moderator						
1.1739E-03	4.3236E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	6.2391E-01	2.6020E-03	2.8062E-02	1.7935E+00	
3.7181E-01	1.6390E-03	8.2754E-03	5.3582E-01			
Cladding						
1.8802E-03	4.4572E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	3.1381E-01	9.6835E-04	2.9602E-04	2.7501E-01	
3.7598E-02	-1.1752E-04	-6.8685E-05	2.6197E-03			
UO2 Fuel - 3.25% U-235						
3.0227E-02	2.7516E-01	8.9034E-03	1.9800E-01	2.5447E+00	2.4338E+00	

1.0000E+00	0.0000E+00	3.9667E-01	2.1983E-03	8.3216E-04	4.0563E-01
4.4473E-02	-2.0207E-04	-1.9314E-04	8.9391E-03		
UO2 Fuel - 2.76% U-235 and 6% Gd <sub>2</sub> O <sub>3</sub>					
5.7296E-02	5.2415E+00	6.2545E-03	6.7367E-02	2.5677E+00	2.4338E+00
1.0000E+00	0.0000E+00	2.6469E-01	3.7030E-03	2.0357E-04	2.7115E-01
3.4010E-02	-4.7917E-04	-4.1691E-05	2.4285E-03		
UO2 Fuel - 3.08% U-235 and 2% Gd <sub>2</sub> O <sub>3</sub>					
3.9186E-02	2.5521E+00	8.4339E-03	1.1562E-01	2.5435E+00	2.4338E+00
1.0000E+00	0.0000E+00	2.5680E-01	2.3291E-03	2.1702E-04	2.5283E-01
3.3177E-02	-3.3136E-04	-4.7078E-05	2.1255E-03		

Central Region for Assembly C3

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Moderator

1.1739E-03	4.3236E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	6.2391E-01	2.6020E-03	2.8062E-02	1.7935E+00
3.7181E-01	1.6390E-03	8.2754E-03	5.3582E-01		

Cladding

1.8802E-03	4.4572E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.1381E-01	9.6835E-04	2.9602E-04	2.7501E-01
3.7598E-02	-1.1752E-04	-6.8685E-05	2.6197E-03		

UO2 Fuel - 3.25% U-235

3.0227E-02	2.7516E-01	8.9034E-03	1.9800E-01	2.5447E+00	2.4338E+00
1.0000E+00	0.0000E+00	3.9667E-01	2.1983E-03	8.3216E-04	4.0563E-01
4.4473E-02	-2.0207E-04	-1.9314E-04	8.9391E-03		

UO2 Fuel - 2.27% U-235 and 8% Gd<sub>2</sub>O<sub>3</sub>

5.7296E-02	5.2415E+00	6.2545E-03	6.7367E-02	2.5677E+00	2.4338E+00
1.0000E+00	0.0000E+00	2.6469E-01	3.7030E-03	2.0357E-04	2.7115E-01
3.4010E-02	-4.7917E-04	-4.1691E-05	2.4285E-03		

UO2 Fuel - 3.08% U-235 and 2% Gd<sub>2</sub>O<sub>3</sub>

3.9186E-02	2.5521E+00	8.4339E-03	1.1562E-01	2.5435E+00	2.4338E+00
1.0000E+00	0.0000E+00	2.5680E-01	2.3291E-03	2.1702E-04	2.5283E-01
3.3177E-02	-3.3136E-04	-4.7078E-05	2.1255E-03		

## APPENDIX C: 4-GROUP CROSS SECTION LIBRARY

### Fuel Blanket and Assembly A1 Cross Sections

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#### Moderator

1.4835E-04	7.4428E-04	5.6055E-03	2.2814E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4127E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.9050E-02	8.9726E-01	0.0000E+00	0.0000E+00
1.9171E-05	8.2313E-02	6.5240E-01	1.6593E-03	1.4817E-06	1.5369E-02
3.8715E-01	1.7243E+00	1.9895E-01	0.0000E+00	0.0000E+00	0.0000E+00
2.5816E-02	5.6785E-01	0.0000E+00	0.0000E+00	0.0000E+00	3.8832E-02
4.3434E-01	1.0418E-03	0.0000E+00	2.6755E-03	1.2379E-01	4.9582E-01

#### Cladding

5.9677E-04	5.0419E-03	1.1725E-03	4.7378E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.5478E-04	3.3169E-01	0.0000E+00	0.0000E+00
0.0000E+00	6.4337E-04	2.6938E-01	6.4907E-04	0.0000E+00	0.0000E+00
5.4407E-03	2.7545E-01	5.5452E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.4010E-04	2.7080E-03	0.0000E+00	0.0000E+00	0.0000E+00	-2.0783E-04
3.7116E-03	-7.8955E-05	0.0000E+00	0.0000E+00	-1.2622E-03	2.5718E-03

#### UO2 Fuel - 2.00% U-235

7.9820E-03	7.2126E-02	3.3805E-02	1.9560E-01	4.3979E-03	9.6878E-03
1.7151E-02	1.3132E-01	2.7516E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3447E-04	0.0000E+00	0.0000E+00	3.5708E-01	0.0000E+00
0.0000E+00	0.0000E+00	1.6241E-03	4.9461E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.4364E-03	3.7761E-01	1.4775E-03	0.0000E+00	0.0000E+00
1.5688E-02	4.0567E-01	6.1816E-02	0.0000E+00	0.0000E+00	0.0000E+00
-4.9820E-04	9.1535E-03	0.0000E+00	0.0000E+00	0.0000E+00	-7.4091E-04
1.2345E-02	-1.3885E-04	0.0000E+00	0.0000E+00	-3.6347E-03	8.8415E-03

### Fuel Cutback for Assembly A1 and A2 Cross Sections

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#### Moderator

1.4820E-04	7.4118E-04	5.6027E-03	2.2638E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4102E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.8845E-02	8.9782E-01	0.0000E+00	0.0000E+00
1.9099E-05	8.1800E-02	6.5276E-01	1.7560E-03	1.4760E-06	1.5274E-02
3.8675E-01	1.7163E+00	1.9875E-01	0.0000E+00	0.0000E+00	0.0000E+00
2.5720E-02	5.6811E-01	0.0000E+00	0.0000E+00	0.0000E+00	3.8563E-02
4.3455E-01	1.1032E-03	0.0000E+00	2.6568E-03	1.2362E-01	4.9616E-01

#### Cladding

5.9631E-04	5.0537E-03	1.1718E-03	4.6974E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0955E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.5265E-04	3.3197E-01	0.0000E+00	0.0000E+00
0.0000E+00	6.3888E-04	2.6940E-01	6.8940E-04	0.0000E+00	0.0000E+00
5.4221E-03	2.7539E-01	5.5507E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.3956E-04	2.7085E-03	0.0000E+00	0.0000E+00	0.0000E+00	-2.0638E-04
3.7069E-03	-8.3831E-05	0.0000E+00	0.0000E+00	-1.2579E-03	2.5780E-03

#### UO2 Fuel - 2.25% U-235

8.0568E-03	7.3755E-02	3.6476E-02	2.1329E-01	4.4728E-03	1.0821E-02
1.9262E-02	1.4606E-01	2.7476E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3393E-04	0.0000E+00	0.0000E+00	3.5687E-01	0.0000E+00
0.0000E+00	0.0000E+00	1.6179E-03	4.9480E-01	0.0000E+00	0.0000E+00

0.0000E+00	2.4193E-03	3.7790E-01	1.5747E-03	0.0000E+00	0.0000E+00
1.5635E-02	4.0574E-01	6.1850E-02	0.0000E+00	0.0000E+00	0.0000E+00
-4.9625E-04	9.1495E-03	0.0000E+00	0.0000E+00	0.0000E+00	-7.3540E-04
1.2334E-02	-1.4745E-04	0.0000E+00	0.0000E+00	-3.6233E-03	8.8563E-03

Fuel Cutback for Assembly B1 and B2 Cross Sections

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Moderator

1.4807E-04	7.3609E-04	5.5979E-03	2.2350E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4062E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.8538E-02	8.9876E-01	0.0000E+00	0.0000E+00
1.8992E-05	8.0956E-02	6.5336E-01	1.9187E-03	1.4676E-06	1.5116E-02
3.8608E-01	1.7032E+00	1.9845E-01	0.0000E+00	0.0000E+00	0.0000E+00
2.5578E-02	5.6854E-01	0.0000E+00	0.0000E+00	0.0000E+00	3.8121E-02
4.3490E-01	1.2064E-03	0.0000E+00	2.6262E-03	1.2333E-01	4.9670E-01

Cladding

5.9556E-04	5.0734E-03	1.1707E-03	4.6312E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0932E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.4946E-04	3.3242E-01	0.0000E+00	0.0000E+00
0.0000E+00	6.3160E-04	2.6943E-01	7.5775E-04	0.0000E+00	0.0000E+00
5.3911E-03	2.7530E-01	5.5590E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.3876E-04	2.7094E-03	0.0000E+00	0.0000E+00	0.0000E+00	-2.0403E-04
3.6992E-03	-9.2091E-05	0.0000E+00	0.0000E+00	-1.2508E-03	2.5885E-03

UO2 Fuel - 2.7% U-235

8.1923E-03	7.6648E-02	4.1267E-02	2.4429E-01	4.6071E-03	1.2829E-02
2.3045E-02	1.7192E-01	2.7409E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3319E-04	0.0000E+00	0.0000E+00	3.5652E-01	0.0000E+00
0.0000E+00	0.0000E+00	1.6086E-03	4.9509E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.3915E-03	3.7843E-01	1.7415E-03	0.0000E+00	0.0000E+00
1.5548E-02	4.0591E-01	6.1903E-02	0.0000E+00	0.0000E+00	0.0000E+00
-4.9332E-04	9.1432E-03	0.0000E+00	0.0000E+00	0.0000E+00	-7.2641E-04
1.2316E-02	-1.6218E-04	0.0000E+00	0.0000E+00	-3.6040E-03	8.8815E-03

Fuel Cutback for Assembly C1, C2, and C3 Cross Sections

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Moderator

1.4804E-04	7.3050E-04	5.5926E-03	2.2041E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4021E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.8236E-02	8.9979E-01	0.0000E+00	0.0000E+00
1.8887E-05	8.0028E-02	6.5404E-01	2.1004E-03	1.4593E-06	1.4944E-02
3.8531E-01	1.6891E+00	1.9815E-01	0.0000E+00	0.0000E+00	0.0000E+00
2.5438E-02	5.6902E-01	0.0000E+00	0.0000E+00	0.0000E+00	3.7635E-02
4.3530E-01	1.3218E-03	0.0000E+00	2.5925E-03	1.2300E-01	4.9728E-01

Cladding

5.9477E-04	5.0955E-03	1.1695E-03	4.5599E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0909E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.4635E-04	3.3290E-01	0.0000E+00	0.0000E+00
0.0000E+00	6.2371E-04	2.6946E-01	8.3464E-04	0.0000E+00	0.0000E+00
5.3559E-03	2.7519E-01	5.5669E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.3797E-04	2.7104E-03	0.0000E+00	0.0000E+00	0.0000E+00	-2.0148E-04
3.6904E-03	-1.0138E-04	0.0000E+00	0.0000E+00	-1.2426E-03	2.6002E-03

UO2 Fuel - 3.25% U-235

8.3587E-03	8.0120E-02	4.7090E-02	2.8093E-01	4.7703E-03	1.5232E-02
2.7642E-02	2.0254E-01	2.7334E+00	2.4338E+00	2.4338E+00	2.4338E+00

9.9967E-01	3.3255E-04	0.0000E+00	0.0000E+00	3.5614E-01	0.0000E+00
0.0000E+00	0.0000E+00	1.5995E-03	4.9541E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.3615E-03	3.7907E-01	1.9326E-03	0.0000E+00	0.0000E+00
1.5448E-02	4.0615E-01	6.1955E-02	0.0000E+00	0.0000E+00	0.0000E+00
-4.9045E-04	9.1367E-03	0.0000E+00	0.0000E+00	0.0000E+00	-7.1661E-04
1.2296E-02	-1.7902E-04	0.0000E+00	0.0000E+00	-3.5820E-03	8.9098E-03

Central Region for Assembly A2

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Moderator

1.4863E-04	7.4203E-04	5.6035E-03	2.2571E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4123E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.9049E-02	8.9768E-01	0.0000E+00	0.0000E+00
1.9171E-05	8.1939E-02	6.5268E-01	1.8051E-03	1.4817E-06	1.5300E-02
3.8684E-01	1.7132E+00	1.9893E-01	0.0000E+00	0.0000E+00	0.0000E+00
2.5816E-02	5.6805E-01	0.0000E+00	0.0000E+00	0.0000E+00	3.8638E-02
4.3450E-01	1.1344E-03	0.0000E+00	2.6620E-03	1.2365E-01	4.9627E-01

Cladding

5.9671E-04	5.0514E-03	1.1720E-03	4.6825E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0968E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.5486E-04	3.3187E-01	0.0000E+00	0.0000E+00
0.0000E+00	6.4069E-04	2.6939E-01	7.1079E-04	0.0000E+00	0.0000E+00
5.4236E-03	2.7537E-01	5.5448E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.4012E-04	2.7084E-03	0.0000E+00	0.0000E+00	0.0000E+00	-2.0696E-04
3.7075E-03	-8.6414E-05	0.0000E+00	0.0000E+00	-1.2583E-03	2.5811E-03

UO2 Fuel - 2.25% U-235

8.0605E-03	7.3830E-02	3.6482E-02	2.1268E-01	4.4722E-03	1.0831E-02
1.9267E-02	1.4559E-01	2.7480E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3393E-04	0.0000E+00	0.0000E+00	3.5696E-01	0.0000E+00
0.0000E+00	0.0000E+00	1.6235E-03	4.9476E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.4264E-03	3.7790E-01	1.6178E-03	0.0000E+00	0.0000E+00
1.5641E-02	4.0566E-01	6.1823E-02	0.0000E+00	0.0000E+00	0.0000E+00
-4.9797E-04	9.1517E-03	0.0000E+00	0.0000E+00	0.0000E+00	-7.3753E-04
1.2336E-02	-1.5122E-04	0.0000E+00	0.0000E+00	-3.6248E-03	8.8609E-03

UO2 Fuel - 2.13% U-235 and 4% Gd<sub>2</sub>O<sub>3</sub>

7.8495E-03	1.0343E-01	1.7241E-01	3.8855E+00	4.0758E-03	9.5940E-03
1.7504E-02	7.3799E-02	2.7475E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3418E-04	0.0000E+00	0.0000E+00	2.2636E-01	0.0000E+00
0.0000E+00	0.0000E+00	3.8383E-04	3.4332E-01	0.0000E+00	0.0000E+00
0.0000E+00	4.0365E-04	2.2526E-01	2.6957E-03	0.0000E+00	0.0000E+00
4.0096E-03	2.6150E-01	4.9125E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0764E-04	1.8594E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2376E-04
2.4948E-03	-3.7187E-04	0.0000E+00	0.0000E+00	-8.5280E-04	2.2322E-03

Central Region for Assembly B1

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Moderator

1.4922E-04	7.3828E-04	5.6002E-03	2.2061E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4146E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.9270E-02	8.9837E-01	0.0000E+00	0.0000E+00
1.9248E-05	8.1318E-02	6.5313E-01	2.1268E-03	1.4878E-06	1.5183E-02
3.8633E-01	1.6900E+00	1.9911E-01	0.0000E+00	0.0000E+00	0.0000E+00
2.5919E-02	5.6836E-01	0.0000E+00	0.0000E+00	0.0000E+00	3.8318E-02
4.3476E-01	1.3387E-03	0.0000E+00	2.6399E-03	1.2343E-01	4.9719E-01

Cladding

5.9695E-04	5.0680E-03	1.1714E-03	4.5701E-03	0.0000E+00	0.0000E+00
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0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0981E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.5708E-04	3.3215E-01	0.0000E+00	0.0000E+00
0.0000E+00	6.3677E-04	2.6943E-01	8.4446E-04	0.0000E+00	0.0000E+00
5.3908E-03	2.7518E-01	5.5386E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.4068E-04	2.7092E-03	0.0000E+00	0.0000E+00	0.0000E+00	-2.0570E-04
3.6998E-03	-1.0256E-04	0.0000E+00	0.0000E+00	-1.2507E-03	2.6010E-03

UO2 Fuel - 2.7% U-235

8.2029E-03	7.6736E-02	4.1284E-02	2.4147E-01	4.6033E-03	1.2854E-02
2.3062E-02	1.6972E-01	2.7422E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3319E-04	0.0000E+00	0.0000E+00	3.5687E-01	0.0000E+00
0.0000E+00	0.0000E+00	1.6272E-03	4.9491E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.4086E-03	3.7843E-01	1.9092E-03	0.0000E+00	0.0000E+00
1.5552E-02	4.0559E-01	6.1805E-02	0.0000E+00	0.0000E+00	0.0000E+00
-4.9904E-04	9.1481E-03	0.0000E+00	0.0000E+00	0.0000E+00	-7.3151E-04
1.2319E-02	-1.7676E-04	0.0000E+00	0.0000E+00	-3.6064E-03	8.8993E-03

UO2 Fuel - 1.89% U-235 and 8% Gd<sub>2</sub>O<sub>3</sub>

7.9282E-03	1.3237E-01	2.7399E-01	5.7762E+00	3.8167E-03	8.0865E-03
1.4790E-02	5.7417E-02	2.7529E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3475E-04	0.0000E+00	0.0000E+00	2.2933E-01	0.0000E+00
0.0000E+00	0.0000E+00	4.0217E-04	3.5663E-01	0.0000E+00	0.0000E+00
0.0000E+00	4.1509E-04	2.2317E-01	3.4720E-03	0.0000E+00	0.0000E+00
4.0056E-03	2.7452E-01	4.9789E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0518E-04	1.9473E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2406E-04
2.4736E-03	-4.4953E-04	0.0000E+00	0.0000E+00	-8.1989E-04	2.4144E-03

UO2 Fuel - 2.56% U-235 and 4% Gd<sub>2</sub>O<sub>3</sub>

8.0033E-03	1.0871E-01	1.7705E-01	3.9135E+00	4.2417E-03	1.1525E-02
2.1002E-02	8.8552E-02	2.7431E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3340E-04	0.0000E+00	0.0000E+00	2.2590E-01	0.0000E+00
0.0000E+00	0.0000E+00	3.8270E-04	3.4534E-01	0.0000E+00	0.0000E+00
0.0000E+00	4.0937E-04	2.2567E-01	2.7366E-03	0.0000E+00	0.0000E+00
3.9992E-03	2.6193E-01	4.9250E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0724E-04	1.8688E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2553E-04
2.4940E-03	-3.7753E-04	0.0000E+00	0.0000E+00	-8.5070E-04	2.2402E-03

Central Region for Assembly B2

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Moderator

1.4966E-04	7.3876E-04	5.6007E-03	2.1992E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4164E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.9438E-02	8.9828E-01	0.0000E+00	0.0000E+00
1.9307E-05	8.1399E-02	6.5308E-01	2.1768E-03	1.4925E-06	1.5198E-02
3.8639E-01	1.6869E+00	1.9926E-01	0.0000E+00	0.0000E+00	0.0000E+00
2.5998E-02	5.6832E-01	0.0000E+00	0.0000E+00	0.0000E+00	3.8363E-02
4.3473E-01	1.3705E-03	0.0000E+00	2.6430E-03	1.2345E-01	4.9731E-01

Cladding

5.9715E-04	5.0669E-03	1.1715E-03	4.5550E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0990E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.5882E-04	3.3209E-01	0.0000E+00	0.0000E+00
0.0000E+00	6.3797E-04	2.6943E-01	8.6600E-04	0.0000E+00	0.0000E+00
5.3901E-03	2.7515E-01	5.5339E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.4112E-04	2.7092E-03	0.0000E+00	0.0000E+00	0.0000E+00	-2.0609E-04
3.6998E-03	-1.0516E-04	0.0000E+00	0.0000E+00	-1.2506E-03	2.6041E-03

UO2 Fuel - 2.7% U-235

8.2068E-03	7.6770E-02	4.1289E-02	2.4082E-01	4.6047E-03	1.2859E-02
2.3067E-02	1.6920E-01	2.7426E+00	2.4338E+00	2.4338E+00	2.4338E+00

9.9967E-01	3.3319E-04	0.0000E+00	0.0000E+00	3.5692E-01	0.0000E+00
0.0000E+00	0.0000E+00	1.6310E-03	4.9489E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.4125E-03	3.7843E-01	1.9498E-03	0.0000E+00	0.0000E+00
1.5552E-02	4.0552E-01	6.1787E-02	0.0000E+00	0.0000E+00	0.0000E+00
-5.0022E-04	9.1494E-03	0.0000E+00	0.0000E+00	0.0000E+00	-7.3267E-04
1.2320E-02	-1.8027E-04	0.0000E+00	0.0000E+00	-3.6068E-03	8.9035E-03

UO2 Fuel - 1.89% U-235 and 8% Gd<sub>2</sub>O<sub>3</sub>

7.9294E-03	1.3172E-01	2.7354E-01	5.5823E+00	3.8137E-03	8.0758E-03
1.4790E-02	5.6936E-02	2.7533E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3475E-04	0.0000E+00	0.0000E+00	2.2942E-01	0.0000E+00
0.0000E+00	0.0000E+00	4.0321E-04	3.5596E-01	0.0000E+00	0.0000E+00
0.0000E+00	4.1495E-04	2.2316E-01	3.5538E-03	0.0000E+00	0.0000E+00
4.0035E-03	2.7317E-01	4.9764E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0546E-04	1.9453E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2399E-04
2.4732E-03	-4.5997E-04	0.0000E+00	0.0000E+00	-8.1954E-04	2.4187E-03

UO2 Fuel - 2.56% U-235 and 2% Gd<sub>2</sub>O<sub>3</sub>

7.9518E-03	9.2508E-02	1.1498E-01	2.6706E+00	4.3615E-03	1.1895E-02
2.1469E-02	9.7604E-02	2.7433E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3340E-04	0.0000E+00	0.0000E+00	2.2444E-01	0.0000E+00
0.0000E+00	0.0000E+00	3.7538E-04	3.3873E-01	0.0000E+00	0.0000E+00
0.0000E+00	4.0760E-04	2.2642E-01	2.1963E-03	0.0000E+00	0.0000E+00
3.9784E-03	2.5323E-01	4.8907E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0907E-04	1.8240E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2663E-04
2.4977E-03	-3.1258E-04	0.0000E+00	0.0000E+00	-8.6277E-04	2.1074E-03

Central Region for Assembly C1

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Moderator

1.4854E-04	7.3197E-04	5.5940E-03	2.1887E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4069E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.8633E-02	8.9953E-01	0.0000E+00	0.0000E+00
1.9026E-05	8.0271E-02	6.5388E-01	2.2123E-03	1.4702E-06	1.4988E-02
3.8549E-01	1.6821E+00	1.9851E-01	0.0000E+00	0.0000E+00	0.0000E+00
2.5622E-02	5.6889E-01	0.0000E+00	0.0000E+00	0.0000E+00	3.7766E-02
4.3521E-01	1.3929E-03	0.0000E+00	2.6016E-03	1.2307E-01	4.9754E-01

Cladding

5.9561E-04	5.0913E-03	1.1699E-03	4.5264E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0935E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.5047E-04	3.3273E-01	0.0000E+00	0.0000E+00
0.0000E+00	6.2690E-04	2.6946E-01	8.8287E-04	0.0000E+00	0.0000E+00
5.3586E-03	2.7512E-01	5.5559E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.3901E-04	2.7102E-03	0.0000E+00	0.0000E+00	0.0000E+00	-2.0251E-04
3.6914E-03	-1.0720E-04	0.0000E+00	0.0000E+00	-1.2433E-03	2.6071E-03

UO2 Fuel - 3.25% U-235

8.3642E-03	8.0225E-02	4.7104E-02	2.7911E-01	4.7674E-03	1.5253E-02
2.7655E-02	2.0108E-01	2.7339E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3255E-04	0.0000E+00	0.0000E+00	3.5634E-01	0.0000E+00
0.0000E+00	0.0000E+00	1.6098E-03	4.9532E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.3729E-03	3.7906E-01	2.0282E-03	0.0000E+00	0.0000E+00
1.5457E-02	4.0597E-01	6.1898E-02	0.0000E+00	0.0000E+00	0.0000E+00
-4.9362E-04	9.1401E-03	0.0000E+00	0.0000E+00	0.0000E+00	-7.2005E-04
1.2299E-02	-1.8735E-04	0.0000E+00	0.0000E+00	-3.5846E-03	8.9199E-03

UO2 Fuel - 2.76% U-235 and 6% Gd<sub>2</sub>O<sub>3</sub>

8.0919E-03	1.2291E-01	2.3394E-01	4.7172E+00	4.1533E-03	1.1898E-02
2.2047E-02	8.8056E-02	2.7381E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3311E-04	0.0000E+00	0.0000E+00	2.2729E-01	0.0000E+00

0.0000E+00	0.0000E+00	3.8862E-04	3.5045E-01	0.0000E+00	0.0000E+00
0.0000E+00	4.0492E-04	2.2495E-01	3.2427E-03	0.0000E+00	0.0000E+00
3.9877E-03	2.6785E-01	4.9547E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0505E-04	1.9076E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2249E-04
2.4828E-03	-4.3345E-04	0.0000E+00	0.0000E+00	-8.3218E-04	2.3470E-03

UO2 Fuel - 3.08% U-235 and 2% Gd<sub>2</sub>O<sub>3</sub>

8.0901E-03	9.3989E-02	1.2069E-01	2.6196E+00	4.5213E-03	1.3993E-02
2.5710E-02	1.1660E-01	2.7351E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3272E-04	0.0000E+00	0.0000E+00	2.2369E-01	0.0000E+00
0.0000E+00	0.0000E+00	3.6721E-04	3.3809E-01	0.0000E+00	0.0000E+00
0.0000E+00	3.9495E-04	2.2693E-01	2.2512E-03	0.0000E+00	0.0000E+00
3.9540E-03	2.5337E-01	4.9080E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0656E-04	1.8209E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2262E-04
2.4939E-03	-3.2041E-04	0.0000E+00	0.0000E+00	-8.5750E-04	2.1162E-03

Central Region for Assembly C2

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Moderator

1.4883E-04	7.3266E-04	5.5948E-03	2.1771E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4097E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.8872E-02	8.9941E-01	0.0000E+00	0.0000E+00
1.9110E-05	8.0383E-02	6.5380E-01	2.2944E-03	1.4768E-06	1.5009E-02
3.8558E-01	1.6768E+00	1.9874E-01	0.0000E+00	0.0000E+00	0.0000E+00
2.5734E-02	5.6884E-01	0.0000E+00	0.0000E+00	0.0000E+00	3.7828E-02
4.3516E-01	1.4451E-03	0.0000E+00	2.6059E-03	1.2311E-01	4.9774E-01

Cladding

5.9611E-04	5.0897E-03	1.1701E-03	4.5024E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0953E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.5296E-04	3.3264E-01	0.0000E+00	0.0000E+00
0.0000E+00	6.2851E-04	2.6946E-01	9.1619E-04	0.0000E+00	0.0000E+00
5.3588E-03	2.7508E-01	5.5495E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.3964E-04	2.7101E-03	0.0000E+00	0.0000E+00	0.0000E+00	-2.0303E-04
3.6917E-03	-1.1122E-04	0.0000E+00	0.0000E+00	-1.2433E-03	2.6119E-03

UO2 Fuel - 3.25% U-235

8.3669E-03	8.0213E-02	4.7108E-02	2.7785E-01	4.7656E-03	1.5259E-02
2.7660E-02	2.0009E-01	2.7343E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3255E-04	0.0000E+00	0.0000E+00	3.5646E-01	0.0000E+00
0.0000E+00	0.0000E+00	1.6156E-03	4.9523E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.3773E-03	3.7906E-01	2.0894E-03	0.0000E+00	0.0000E+00
1.5458E-02	4.0586E-01	6.1865E-02	0.0000E+00	0.0000E+00	0.0000E+00
-4.9539E-04	9.1413E-03	0.0000E+00	0.0000E+00	0.0000E+00	-7.2136E-04
1.2300E-02	-1.9266E-04	0.0000E+00	0.0000E+00	-3.5853E-03	8.9264E-03

UO2 Fuel 2.76% U-235 and 6% Gd<sub>2</sub>O<sub>3</sub>

8.1103E-03	1.2410E-01	2.3385E-01	4.7344E+00	4.1742E-03	1.1958E-02
2.2060E-02	8.8057E-02	2.7394E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3311E-04	0.0000E+00	0.0000E+00	2.2726E-01	0.0000E+00
0.0000E+00	0.0000E+00	3.8976E-04	3.5168E-01	0.0000E+00	0.0000E+00
0.0000E+00	4.0785E-04	2.2495E-01	3.2481E-03	0.0000E+00	0.0000E+00
3.9900E-03	2.6789E-01	4.9580E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0537E-04	1.9118E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2342E-04
2.4833E-03	-4.3417E-04	0.0000E+00	0.0000E+00	-8.3267E-04	2.3479E-03

UO2 Fuel - 3.08% U-235 and 2% Gd<sub>2</sub>O<sub>3</sub>

8.1024E-03	9.5593E-02	1.2056E-01	2.6481E+00	4.5253E-03	1.4102E-02
2.5739E-02	1.1680E-01	2.7356E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3272E-04	0.0000E+00	0.0000E+00	2.2383E-01	0.0000E+00
0.0000E+00	0.0000E+00	3.6995E-04	3.3916E-01	0.0000E+00	0.0000E+00



0.0000E+00	4.0119E-04	2.2692E-01	2.2501E-03	0.0000E+00	0.0000E+00
3.9604E-03	2.5350E-01	4.9037E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0737E-04	1.8258E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2459E-04
2.4954E-03	-3.2024E-04	0.0000E+00	0.0000E+00	-8.5890E-04	2.1166E-03

Central Region for Assembly C3

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Moderator

1.7684E-04	1.4828E-03	1.1225E-02	4.3236E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6615E-01	0.0000E+00
0.0000E+00	0.0000E+00	6.3549E-02	9.6627E-01	0.0000E+00	0.0000E+00
2.0644E-05	8.7712E-02	7.0374E-01	2.6020E-03	1.5960E-06	1.6377E-02
4.1442E-01	1.7935E+00	2.1344E-01	0.0000E+00	0.0000E+00	0.0000E+00
2.7798E-02	6.1123E-01	0.0000E+00	0.0000E+00	0.0000E+00	4.1350E-02
4.6826E-01	1.6390E-03	0.0000E+00	2.8488E-03	1.3227E-01	5.3582E-01

Cladding

5.9424E-04	5.0661E-03	1.1697E-03	4.4572E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0900E-01	0.0000E+00
0.0000E+00	0.0000E+00	5.5490E-04	3.3201E-01	0.0000E+00	0.0000E+00
0.0000E+00	6.3855E-04	2.6948E-01	9.6835E-04	0.0000E+00	0.0000E+00
5.3369E-03	2.7501E-01	5.5390E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.4013E-04	2.7087E-03	0.0000E+00	0.0000E+00	0.0000E+00	-2.0627E-04
3.6865E-03	-1.1752E-04	0.0000E+00	0.0000E+00	-1.2383E-03	2.6197E-03

UO2 Fuel - 3.25% U-235

8.4096E-03	8.1355E-02	4.7105E-02	2.7516E-01	4.8161E-03	1.5367E-02
2.7652E-02	1.9800E-01	2.7373E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3255E-04	0.0000E+00	0.0000E+00	3.5585E-01	0.0000E+00
0.0000E+00	0.0000E+00	1.6173E-03	4.9570E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.4172E-03	3.7911E-01	2.1983E-03	0.0000E+00	0.0000E+00
1.5400E-02	4.0563E-01	6.1976E-02	0.0000E+00	0.0000E+00	0.0000E+00
-4.9591E-04	9.1558E-03	0.0000E+00	0.0000E+00	0.0000E+00	-7.3366E-04
1.2288E-02	-2.0207E-04	0.0000E+00	0.0000E+00	-3.5743E-03	8.9391E-03

UO2 Fuel - 2.27% U-235 and 8% Gd<sub>2</sub>O<sub>3</sub>

8.0541E-03	1.3490E-01	2.7792E-01	5.2415E+00	3.9615E-03	9.6524E-03
1.7701E-02	6.7367E-02	2.7495E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3390E-04	0.0000E+00	0.0000E+00	2.2889E-01	0.0000E+00
0.0000E+00	0.0000E+00	4.0031E-04	3.5678E-01	0.0000E+00	0.0000E+00
0.0000E+00	4.1606E-04	2.2352E-01	3.7030E-03	0.0000E+00	0.0000E+00
3.9689E-03	2.7115E-01	4.9945E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0462E-04	1.9496E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2430E-04
2.4673E-03	-4.7917E-04	0.0000E+00	0.0000E+00	-8.1284E-04	2.4285E-03

UO2 Fuel - 3.08% U-235 and 2% Gd<sub>2</sub>O<sub>3</sub>

8.1342E-03	9.6821E-02	1.2065E-01	2.5521E+00	4.5645E-03	1.4214E-02
2.5728E-02	1.1562E-01	2.7387E+00	2.4338E+00	2.4338E+00	2.4338E+00
9.9967E-01	3.3272E-04	0.0000E+00	0.0000E+00	2.2379E-01	0.0000E+00
0.0000E+00	0.0000E+00	3.7211E-04	3.3961E-01	0.0000E+00	0.0000E+00
0.0000E+00	4.0891E-04	2.2693E-01	2.3291E-03	0.0000E+00	0.0000E+00
3.9450E-03	2.5283E-01	4.9100E-02	0.0000E+00	0.0000E+00	0.0000E+00
-1.0800E-04	1.8293E-03	0.0000E+00	0.0000E+00	0.0000E+00	-1.2700E-04
2.4920E-03	-3.3136E-04	0.0000E+00	0.0000E+00	-8.5580E-04	2.1255E-03

## APPENDIX D: 8-GROUP CROSS SECTION LIBRARY

### Fuel Blanket and Assembly Al Cross Sections

#### Moderator

7.3721E-04	3.9736E-06	1.8550E-05	2.3196E-04	1.5288E-03	5.6055E-03
1.3429E-02	2.8710E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.6417E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6362E-02	1.1202E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.5304E-02	1.1754E-01	4.6239E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	2.8074E-04	1.1775E-03	1.0324E-01	7.8704E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1066E-05
1.4290E-03	1.9566E-01	7.6643E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.4187E-05	5.0637E-03	2.0060E-01	6.5240E-01
4.3002E-03	0.0000E+00	0.0000E+00	0.0000E+00	2.6422E-06	7.3489E-04
2.8717E-02	3.2151E-01	8.4619E-01	1.7129E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.1653E-04	8.7299E-03	6.5633E-02	4.5405E-01	1.8194E+00
3.2157E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.0137E-02	6.1152E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.9950E-03	5.4184E-02
2.7903E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.1556E-05	7.6281E-05	4.5917E-02	5.1686E-01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.1115E-05	8.7884E-02
5.1137E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.5599E-04	9.7596E-02	4.3434E-01	2.7000E-03	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	9.8837E-06	5.9791E-03	1.1880E-01
4.4950E-01	3.0649E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.7817E-04	4.9869E-03	6.6846E-02	4.5227E-01		

#### Cladding

1.1092E-04	5.1021E-04	7.9729E-04	7.7799E-03	7.8499E-04	1.1725E-03
2.8097E-03	5.9841E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1849E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4579E-02	2.2785E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.0424E-02	1.6021E-02	3.8486E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.1817E-08	2.2502E-07	9.9144E-04	3.6973E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.2552E-03	2.7060E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.6436E-03	2.6938E-01
1.6532E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.4407E-03	2.5795E-01	9.2467E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.5613E-02	2.6743E-01
5.3136E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-4.6312E-04	7.8940E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.6186E-05	-7.8386E-04
4.6028E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-2.5040E-04	3.1929E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-4.0676E-04
2.5865E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-5.3095E-04	3.7116E-03	-2.0110E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.2622E-03
5.6953E-03	-1.6549E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-9.8531E-10	-2.9236E-03	4.0976E-03		

UO2 Fuel - 2.00% U-235

1.4344E-02	7.8402E-03	5.9173E-03	3.5406E-02	1.3079E-01	3.3805E-02
1.1177E-01	2.5244E-01	1.3337E-02	5.8735E-03	7.2282E-04	4.6159E-03
1.7791E-02	1.7151E-02	7.5437E-02	1.6922E-01	2.8834E+00	2.6145E+00
2.4514E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5051E-01	4.1036E-01	2.3880E-01	3.3447E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.7539E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6361E-02	2.3844E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2588E-02	5.9011E-02	4.2573E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.1290E-06	1.4886E-05	2.9088E-03	5.0983E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.1257E-03	4.6210E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.3293E-03	3.7761E-01
3.6568E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.5688E-02	3.6356E-01	2.7469E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4617E-02	3.8328E-01
9.7658E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.6733E-04	7.3299E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9602E-04	-1.0617E-02
4.9439E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.0961E-07	0.0000E+00	-8.9541E-04	9.9911E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.5797E-03
1.0339E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-1.9247E-03	1.2345E-02	-3.4365E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.6344E-03
1.4651E-02	-4.6954E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9472E-07	-5.4752E-03	1.3310E-02		

Fuel Cutback for Assembly A1 and A2 Cross Sections

Moderator

7.3625E-04	3.9734E-06	1.8527E-05	2.3180E-04	1.5270E-03	5.6027E-03
1.3378E-02	2.8670E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.6416E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6374E-02	1.1202E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.5310E-02	1.1755E-01	4.6226E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	2.8082E-04	1.1776E-03	1.0303E-01	7.8729E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1067E-05
1.4261E-03	1.9539E-01	7.6692E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.4108E-05	5.0568E-03	2.0019E-01	6.5276E-01
4.4520E-03	0.0000E+00	0.0000E+00	0.0000E+00	2.6359E-06	7.3389E-04
2.8658E-02	3.2118E-01	8.4791E-01	1.7168E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.1621E-04	8.7118E-03	6.5570E-02	4.4993E-01	1.8171E+00
3.2156E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.0146E-02	6.1150E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.9977E-03	5.4190E-02
2.7892E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.1560E-05	7.6290E-05	4.5813E-02	5.1698E-01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.0921E-05	8.7751E-02
5.1163E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.5528E-04	9.7348E-02	4.3455E-01	2.7969E-03	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	9.8682E-06	5.9639E-03	1.1863E-01
4.5041E-01	3.0828E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.7615E-04	4.9826E-03	6.5896E-02	4.5220E-01		

Cladding

1.1150E-04	5.1021E-04	7.9671E-04	7.7774E-03	7.8606E-04	1.1718E-03
2.7987E-03	5.9723E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1848E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4581E-02	2.2786E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.0427E-02	1.6020E-02	3.8481E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.1797E-08	2.2506E-07	9.8906E-04	3.6988E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.2524E-03	2.7060E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E-03	2.6940E-01
1.7162E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.4221E-03	2.5823E-01	9.3249E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.5276E-02	2.6734E-01
5.3128E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-4.6329E-04	7.8943E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.6192E-05	-7.8409E-04
4.6087E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-2.4980E-04	3.1931E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-4.0586E-04
2.5852E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-5.2975E-04	3.7069E-03	-2.0868E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.2579E-03
5.6421E-03	-1.6673E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-9.8194E-10	-2.8629E-03	4.1104E-03		

UO2 Fuel - 2.25% U-235

1.4382E-02	7.8968E-03	6.0093E-03	3.6180E-02	1.3431E-01	3.6476E-02
1.2248E-01	2.7752E-01	1.3373E-02	5.9297E-03	8.1129E-04	5.1850E-03
1.9905E-02	1.9262E-02	8.4446E-02	1.8963E-01	2.8831E+00	2.6141E+00
2.4513E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5050E-01	4.1043E-01	2.3873E-01	3.3393E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.7539E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6335E-02	2.3840E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2593E-02	5.9001E-02	4.2557E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.1574E-06	1.4958E-05	2.9017E-03	5.0983E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.1144E-03	4.6232E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.3182E-03	3.7790E-01
3.8011E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.5635E-02	3.6436E-01	2.7715E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.3947E-02	3.8328E-01
9.7660E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.7037E-04	7.3302E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9549E-04	-1.0621E-02
4.9478E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.0624E-07	0.0000E+00	-8.9319E-04	9.9895E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.5762E-03
1.0336E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-1.9205E-03	1.2334E-02	-3.5593E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.6230E-03
1.4581E-02	-4.7218E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9362E-07	-5.3906E-03	1.3342E-02		

Fuel Cutback for Assembly B1 and B2 Cross Sections

Moderator

7.3510E-04	3.9732E-06	1.8494E-05	2.3155E-04	1.5240E-03	5.5979E-03
1.3296E-02	2.8605E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

0.0000E+00	0.0000E+00	5.6415E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6388E-02	1.1202E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.5317E-02	1.1757E-01	4.6208E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	2.8090E-04	1.1777E-03	1.0271E-01	7.8772E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1069E-05
1.4216E-03	1.9495E-01	7.6773E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.3992E-05	5.0455E-03	1.9949E-01	6.5336E-01
4.6966E-03	0.0000E+00	0.0000E+00	0.0000E+00	2.6266E-06	7.3225E-04
2.8559E-02	3.2061E-01	8.5064E-01	1.7232E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.1569E-04	8.6819E-03	6.5465E-02	4.4338E-01	1.8135E+00
3.2155E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.0156E-02	6.1148E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	9.0008E-03	5.4196E-02
2.7875E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.1565E-05	7.6302E-05	4.5659E-02	5.1718E-01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.0636E-05	8.7536E-02
5.1206E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.5412E-04	9.6939E-02	4.3490E-01	2.9531E-03	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	9.8431E-06	5.9389E-03	1.1835E-01
4.5185E-01	3.1124E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.7281E-04	4.9755E-03	6.4389E-02	4.5208E-01		

Cladding

1.1224E-04	5.1021E-04	7.9587E-04	7.7734E-03	7.8784E-04	1.1707E-03
2.7812E-03	5.9532E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1847E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4583E-02	2.2786E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.0431E-02	1.6020E-02	3.8472E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.1779E-08	2.2511E-07	9.8553E-04	3.7011E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.2478E-03	2.7060E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.6341E-03	2.6943E-01
1.8182E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.3911E-03	2.5865E-01	9.4553E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.4742E-02	2.6720E-01
5.3118E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-4.6347E-04	7.8947E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.6198E-05	-7.8435E-04
4.6173E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-2.4891E-04	3.1933E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-4.0437E-04
2.5833E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-5.2788E-04	3.6992E-03	-2.2097E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.2508E-03
5.5580E-03	-1.6880E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-9.7631E-10	-2.7667E-03	4.1316E-03		

UO2 Fuel - 2.7% U-235

1.4451E-02	7.9993E-03	6.1765E-03	3.7570E-02	1.4053E-01	4.1267E-02
1.4157E-01	3.2221E-01	1.3438E-02	6.0316E-03	9.7047E-04	6.2062E-03
2.3657E-02	2.3045E-02	1.0052E-01	2.2608E-01	2.8826E+00	2.6134E+00
2.4511E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5049E-01	4.1054E-01	2.3864E-01	3.3319E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.7539E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6284E-02	2.3833E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2602E-02	5.8982E-02	4.2531E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.2258E-06	1.5088E-05	2.8913E-03	5.0982E-01

0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.0954E-03	4.6269E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.3013E-03	3.7843E-01
4.0373E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.5548E-02	3.6571E-01	2.8134E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.2879E-02	3.8333E-01
9.7662E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.7556E-04	7.3306E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9450E-04	-1.0626E-02
4.9535E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.0134E-07	0.0000E+00	-8.8990E-04	9.9871E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.5703E-03
1.0331E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-1.9140E-03	1.2316E-02	-3.7599E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.6038E-03
1.4469E-02	-4.7668E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9177E-07	-5.2554E-03	1.3396E-02		

Fuel Cutback for Assembly C1, C2, and C3 Cross Sections

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Moderator

7.3423E-04	3.9730E-06	1.8461E-05	2.3131E-04	1.5206E-03	5.5926E-03
1.3211E-02	2.8536E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.6415E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6398E-02	1.1202E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.5323E-02	1.1757E-01	4.6191E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	2.8097E-04	1.1778E-03	1.0241E-01	7.8817E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1071E-05
1.4174E-03	1.9448E-01	7.6863E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.3880E-05	5.0334E-03	1.9873E-01	6.5404E-01
4.9555E-03	0.0000E+00	0.0000E+00	0.0000E+00	2.6176E-06	7.3050E-04
2.8451E-02	3.1997E-01	8.5347E-01	1.7301E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.1514E-04	8.6488E-03	6.5345E-02	4.3658E-01	1.8096E+00
3.2154E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.0164E-02	6.1147E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	9.0032E-03	5.4201E-02
2.7858E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.1568E-05	7.6309E-05	4.5511E-02	5.1738E-01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.0361E-05	8.7307E-02
5.1254E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.5289E-04	9.6488E-02	4.3530E-01	3.1185E-03	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	9.8164E-06	5.9114E-03	1.1804E-01
4.5334E-01	3.1444E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.6914E-04	4.9674E-03	6.2827E-02	4.5194E-01		

Cladding

1.1282E-04	5.1021E-04	7.9506E-04	7.7693E-03	7.8985E-04	1.1695E-03
2.7628E-03	5.9330E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1847E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4585E-02	2.2787E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.0434E-02	1.6020E-02	3.8464E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.1766E-08	2.2514E-07	9.8214E-04	3.7035E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.2427E-03	2.7059E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.6280E-03	2.6946E-01

1.9270E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.3559E-03	2.5909E-01	9.5967E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.4188E-02	2.6704E-01
5.3111E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-4.6362E-04	7.8949E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.6203E-05	-7.8451E-04
4.6255E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-2.4805E-04	3.1933E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-4.0271E-04
2.5813E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-5.2591E-04	3.6904E-03	-2.3406E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.2426E-03
5.4712E-03	-1.7104E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-9.6993E-10	-2.6669E-03	4.1546E-03		

UO2 Fuel - 3.25% U-235

1.4536E-02	8.1253E-03	6.3829E-03	3.9265E-02	1.4799E-01	4.7090E-02
1.6464E-01	3.7616E-01	1.3519E-02	6.1569E-03	1.1649E-03	7.4492E-03
2.8162E-02	2.7642E-02	1.1995E-01	2.7016E-01	2.8822E+00	2.6125E+00
2.4510E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5048E-01	4.1063E-01	2.3856E-01	3.3255E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.7538E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6217E-02	2.3823E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2612E-02	5.8955E-02	4.2501E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.3258E-06	1.5246E-05	2.8813E-03	5.0977E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.0743E-03	4.6310E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.2847E-03	3.7907E-01
4.2929E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.5448E-02	3.6719E-01	2.8612E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.1766E-02	3.8343E-01
9.7662E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.8164E-04	7.3309E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9326E-04	-1.0630E-02
4.9588E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.9647E-07	0.0000E+00	-8.8670E-04	9.9848E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.5638E-03
1.0326E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-1.9071E-03	1.2296E-02	-3.9766E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.5817E-03
1.4353E-02	-4.8178E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.8966E-07	-5.1136E-03	1.3458E-02		

Central Region for Assembly A2

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Moderator

7.3823E-04	3.9736E-06	1.8552E-05	2.3190E-04	1.5274E-03	5.6035E-03
1.3350E-02	2.8670E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.6422E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6347E-02	1.1202E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.5296E-02	1.1754E-01	4.6240E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	2.8065E-04	1.1774E-03	1.0327E-01	7.8718E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1066E-05
1.4294E-03	1.9551E-01	7.6679E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.4196E-05	5.0599E-03	2.0030E-01	6.5268E-01
4.5342E-03	0.0000E+00	0.0000E+00	0.0000E+00	2.6429E-06	7.3434E-04
2.8673E-02	3.2126E-01	8.4884E-01	1.7173E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.1636E-04	8.7166E-03	6.5586E-02	4.4772E-01	1.8171E+00

3.2161E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.0126E-02	6.1152E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.9917E-03	5.4184E-02	0.0000E+00
2.7905E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.1551E-05	7.6280E-05	4.5930E-02	5.1692E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.1138E-05	8.7813E-02	0.0000E+00
5.1155E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.5561E-04	9.7421E-02	4.3450E-01	2.8494E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	9.8754E-06	5.9684E-03	1.1867E-01	0.0000E+00
4.5090E-01	3.0852E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.7674E-04	4.9833E-03	6.5388E-02	4.5218E-01			

Cladding

1.1065E-04	5.1021E-04	7.9737E-04	7.7789E-03	7.8590E-04	1.1720E-03	0.0000E+00
2.7924E-03	5.9725E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1849E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4579E-02	2.2784E-01	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.0421E-02	1.6021E-02	3.8487E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.1839E-08	2.2499E-07	9.9181E-04	3.6979E-01	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.2533E-03	2.7060E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.6426E-03	2.6939E-01	0.0000E+00
1.7521E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.4236E-03	2.5838E-01	9.3349E-03	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.5086E-02	2.6733E-01	0.0000E+00
5.3139E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-4.6301E-04	7.8939E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.6181E-05	-7.8372E-04	0.0000E+00
4.6018E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-2.5050E-04	3.1927E-03	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-4.0615E-04	0.0000E+00
2.5861E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-5.3063E-04	3.7075E-03	-2.1301E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.2583E-03	0.0000E+00
5.6122E-03	-1.6688E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-9.8221E-10	-2.8288E-03	4.1118E-03			

UO2 Fuel - 2.25% U-235

1.4383E-02	7.8986E-03	6.0154E-03	3.6195E-02	1.3435E-01	3.6482E-02	0.0000E+00
1.2218E-01	2.7765E-01	1.3376E-02	5.9317E-03	8.1166E-04	5.1873E-03	0.0000E+00
1.9905E-02	1.9267E-02	8.4238E-02	1.8964E-01	2.8835E+00	2.6141E+00	0.0000E+00
2.4512E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	0.0000E+00
3.5050E-01	4.1043E-01	2.3873E-01	3.3393E-04	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.7538E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6323E-02	2.3839E-01	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2593E-02	5.8992E-02	4.2564E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.1994E-06	1.4957E-05	2.9091E-03	5.0984E-01	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.1184E-03	4.6230E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.3279E-03	3.7790E-01	0.0000E+00
3.8710E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.5641E-02	3.6462E-01	2.7732E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.3608E-02	3.8327E-01	0.0000E+00
9.7657E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.6943E-04	7.3297E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9539E-04	-1.0615E-02	0.0000E+00
4.9436E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.0910E-07	0.0000E+00	-8.9546E-04	9.9909E-03	0.0000E+00	0.0000E+00	0.0000E+00



0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.5774E-03
1.0339E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-1.9235E-03	1.2336E-02	-3.6183E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.6245E-03
1.4544E-02	-4.7227E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9369E-07	-5.3473E-03	1.3343E-02		

UO2 Fuel - 2.13% U-235 and 4% Gd<sub>2</sub>O<sub>3</sub>

1.2346E-02	7.6446E-03	6.5257E-03	5.2160E-02	1.8852E-01	1.7241E-01
1.5012E+00	2.2587E+01	1.2652E-02	5.5527E-03	7.3121E-04	4.6378E-03
1.7821E-02	1.7504E-02	6.6718E-02	1.2934E-01	2.8836E+00	2.6142E+00
2.4509E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5050E-01	4.1040E-01	2.3876E-01	3.3418E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.2017E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.1425E-02	1.3788E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.3096E-02	3.7877E-02	2.6482E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.0593E-06	1.7419E-05	6.6281E-04	3.6605E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.0419E-03	3.0386E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0737E-03	2.2526E-01
3.0394E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.0096E-03	2.4199E-01	2.4246E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	5.5816E-03	3.4656E-01
8.2100E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.0976E-03	5.3298E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.8438E-04	-7.3985E-04
3.6817E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.8457E-07	0.0000E+00	-1.8887E-04	2.1290E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.1348E-04
1.9323E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.2918E-04	2.4948E-03	-4.1929E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.5277E-04
3.0696E-03	-3.0404E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9700E-08	-8.6161E-04	5.4631E-03		

Central Region for Assembly B1

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Moderator

7.4096E-04	3.9738E-06	1.8581E-05	2.3184E-04	1.5251E-03	5.6002E-03
1.3192E-02	2.8590E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.6435E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6308E-02	1.1202E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.5275E-02	1.1752E-01	4.6257E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	2.8042E-04	1.1773E-03	1.0353E-01	7.8738E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1064E-05
1.4330E-03	1.9531E-01	7.6738E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.4292E-05	5.0548E-03	1.9980E-01	6.5313E-01
5.0158E-03	0.0000E+00	0.0000E+00	0.0000E+00	2.6506E-06	7.3359E-04
2.8602E-02	3.2083E-01	8.5409E-01	1.7264E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.1613E-04	8.6949E-03	6.5508E-02	4.3505E-01	1.8125E+00
3.2171E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.0097E-02	6.1154E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.9829E-03	5.4178E-02
2.7920E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.1539E-05	7.6269E-05	4.6057E-02	5.1702E-01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.1373E-05	8.7717E-02
5.1185E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.5510E-04	9.7142E-02	4.3476E-01	3.1572E-03	0.0000E+00

0.0000E+00	0.0000E+00	0.0000E+00	9.8644E-06	5.9514E-03	1.1845E-01
4.5367E-01	3.1273E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.7445E-04	4.9770E-03	6.2482E-02	4.5196E-01		

Cladding

1.0909E-04	5.1021E-04	7.9804E-04	7.7777E-03	7.8750E-04	1.1714E-03
2.7586E-03	5.9508E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1850E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4576E-02	2.2783E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.0409E-02	1.6021E-02	3.8494E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.1925E-08	2.2493E-07	9.9459E-04	3.6987E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.2503E-03	2.7059E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.6427E-03	2.6943E-01
1.9524E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.3908E-03	2.5918E-01	9.5139E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.4073E-02	2.6714E-01
5.3160E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-4.6246E-04	7.8934E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.6158E-05	-7.8336E-04
4.5945E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-2.5120E-04	3.1923E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-4.0518E-04
2.5861E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-5.3064E-04	3.6998E-03	-2.3711E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.2507E-03
5.4531E-03	-1.6967E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-9.7625E-10	-2.6458E-03	4.1405E-03		

UO2 Fuel - 2.7% U-235

1.4455E-02	8.0041E-03	6.1962E-03	3.7587E-02	1.4042E-01	4.1284E-02
1.4036E-01	3.2267E-01	1.3451E-02	6.0371E-03	9.7191E-04	6.2137E-03
2.3656E-02	2.3062E-02	9.9643E-02	2.2599E-01	2.8843E+00	2.6134E+00
2.4510E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5049E-01	4.1054E-01	2.3864E-01	3.3319E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.7536E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6246E-02	2.3829E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2601E-02	5.8956E-02	4.2556E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.3908E-06	1.5083E-05	2.9144E-03	5.0971E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.1060E-03	4.6253E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.3269E-03	3.7843E-01
4.2863E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.5552E-02	3.6657E-01	2.8237E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.1719E-02	3.8322E-01
9.7639E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.7282E-04	7.3292E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9417E-04	-1.0612E-02
4.9398E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.1258E-07	0.0000E+00	-8.9701E-04	9.9904E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.5736E-03
1.0338E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-1.9215E-03	1.2319E-02	-3.9684E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.6061E-03
1.4341E-02	-4.7738E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9175E-07	-5.1060E-03	1.3403E-02		

UO2 Fuel - 1.89% U-235 and 8% Gd<sub>2</sub>O<sub>3</sub>

1.1674E-02	7.4214E-03	6.9607E-03	6.8228E-02	2.3896E-01	2.7399E-01
2.3849E+00	4.4415E+01	1.1941E-02	5.2154E-03	6.1575E-04	3.8948E-03
1.5053E-02	1.4790E-02	5.2927E-02	1.0857E-01	2.8856E+00	2.6147E+00
2.4509E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5051E-01	4.1032E-01	2.3883E-01	3.3475E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.2119E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.2033E-02	1.4195E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.3713E-02	3.8533E-02	2.6756E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.0013E-06	1.9717E-05	6.9632E-04	3.8503E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.0656E-03	3.0766E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1050E-03	2.2317E-01
3.7767E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.0056E-03	2.5012E-01	2.9960E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.7081E-03	4.6894E-01
8.2885E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.0276E-03	5.5650E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.6902E-04	-7.6201E-04
3.6601E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.6793E-07	0.0000E+00	-1.8519E-04	2.2364E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.0413E-04
1.9722E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.3025E-04	2.4736E-03	-4.8898E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.1986E-04
2.9720E-03	-2.8975E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9585E-08	-6.2163E-04	6.0413E-03		

UO2 Fuel - 2.56% U-235 and 4% Gd<sub>2</sub>O<sub>3</sub>

1.2402E-02	7.7549E-03	6.6986E-03	5.4074E-02	1.9843E-01	1.7705E-01
1.5076E+00	2.2753E+01	1.2726E-02	5.6654E-03	8.7725E-04	5.5778E-03
2.1293E-02	2.1002E-02	7.9965E-02	1.5579E-01	2.8857E+00	2.6136E+00
2.4506E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5049E-01	4.1051E-01	2.3866E-01	3.3340E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.2017E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.1325E-02	1.3776E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.3095E-02	3.7853E-02	2.6480E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.3139E-06	1.7505E-05	6.6584E-04	3.6825E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.0433E-03	3.0601E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0817E-03	2.2567E-01
3.0860E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	3.9992E-03	2.4236E-01	2.4161E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	5.5424E-03	3.4763E-01
8.2095E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.0909E-03	5.3301E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.8302E-04	-7.3510E-04
3.6762E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.9315E-07	0.0000E+00	-1.8967E-04	2.1390E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.1412E-04
1.9410E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.3169E-04	2.4940E-03	-4.2574E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.5067E-04
3.0722E-03	-3.0334E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9580E-08	-8.5586E-04	5.4605E-03		

Central Region for Assembly B2

Moderator

7.4285E-04	3.9739E-06	1.8602E-05	2.3190E-04	1.5254E-03	5.6007E-03
1.3168E-02	2.8589E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.6441E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6282E-02	1.1202E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.5262E-02	1.1752E-01	4.6268E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	2.8026E-04	1.1773E-03	1.0373E-01	7.8731E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1063E-05
1.4357E-03	1.9539E-01	7.6729E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.4364E-05	5.0568E-03	1.9987E-01	6.5308E-01
5.0886E-03	0.0000E+00	0.0000E+00	0.0000E+00	2.6563E-06	7.3389E-04
2.8612E-02	3.2087E-01	8.5488E-01	1.7270E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.1622E-04	8.6980E-03	6.5518E-02	4.3316E-01	1.8123E+00
3.2176E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.0078E-02	6.1155E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.9772E-03	5.4175E-02
2.7931E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.1531E-05	7.6265E-05	4.6152E-02	5.1698E-01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.1549E-05	8.7757E-02
5.1180E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.5531E-04	9.7190E-02	4.3473E-01	3.2037E-03	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	9.8690E-06	5.9544E-03	1.1847E-01
4.5409E-01	3.1305E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.7484E-04	4.9773E-03	6.2048E-02	4.5193E-01		

Cladding

1.0797E-04	5.1021E-04	7.9856E-04	7.7786E-03	7.8743E-04	1.1715E-03
2.7534E-03	5.9507E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1851E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4573E-02	2.2783E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.0402E-02	1.6021E-02	3.8500E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.1967E-08	2.2491E-07	9.9677E-04	3.6982E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.2508E-03	2.7059E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.6448E-03	2.6943E-01
1.9840E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.3901E-03	2.5931E-01	9.5278E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.3915E-02	2.6713E-01
5.3175E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-4.6214E-04	7.8933E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.6146E-05	-7.8330E-04
4.5890E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-2.5175E-04	3.1920E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-4.0535E-04
2.5868E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-5.3133E-04	3.6998E-03	-2.4091E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.2506E-03
5.4283E-03	-1.6987E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-9.7612E-10	-2.6173E-03	4.1426E-03		

UO2 Fuel - 2.7% U-235

1.4456E-02	8.0064E-03	6.2008E-03	3.7595E-02	1.4044E-01	4.1289E-02
1.4008E-01	3.2283E-01	1.3455E-02	6.0398E-03	9.7225E-04	6.2153E-03
2.3658E-02	2.3067E-02	9.9441E-02	2.2599E-01	2.8849E+00	2.6134E+00
2.4509E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5049E-01	4.1054E-01	2.3864E-01	3.3319E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.7536E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6229E-02	2.3827E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2.2600E-02	5.8942E-02	4.2562E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.4435E-06	1.5081E-05	2.9199E-03	5.0971E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.1081E-03	4.6252E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.3332E-03	3.7843E-01
4.3444E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.5552E-02	3.6677E-01	2.8257E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.1452E-02	3.8320E-01
9.7636E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.7153E-04	7.3286E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9404E-04	-1.0605E-02
4.9365E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.1617E-07	0.0000E+00	-8.9870E-04	9.9911E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.5742E-03
1.0340E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-1.9234E-03	1.2320E-02	-4.0167E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.6065E-03
1.4312E-02	-4.7751E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9171E-07	-5.0716E-03	1.3404E-02		

UO2 Fuel - 1.89% U-235 and 8% Gd<sub>2</sub>O<sub>3</sub>

1.1671E-02	7.4213E-03	6.9648E-03	6.8067E-02	2.3771E-01	2.7354E-01
2.3415E+00	4.4281E+01	1.1945E-02	5.2154E-03	6.1590E-04	3.8948E-03
1.5038E-02	1.4790E-02	5.2621E-02	1.0846E-01	2.8862E+00	2.6147E+00
2.4508E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5051E-01	4.1032E-01	2.3883E-01	3.3475E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.2119E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.2023E-02	1.4195E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.3712E-02	3.8533E-02	2.6760E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.0492E-06	1.9717E-05	6.9725E-04	3.8429E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.0655E-03	3.0701E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1059E-03	2.2316E-01
3.8515E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.0035E-03	2.4976E-01	3.0061E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.5489E-03	4.6831E-01
8.2881E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.0270E-03	5.5650E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.6893E-04	-7.6202E-04
3.6585E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.7113E-07	0.0000E+00	-1.8545E-04	2.2343E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.0412E-04
1.9705E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.3046E-04	2.4732E-03	-4.9849E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.1951E-04
2.9612E-03	-2.9060E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9567E-08	-6.0300E-04	6.0472E-03		

UO2 Fuel - 2.56% U-235 and 2% Gd<sub>2</sub>O<sub>3</sub>

1.2726E-02	7.8549E-03	6.4574E-03	4.5540E-02	1.6855E-01	1.1498E-01
9.3322E-01	1.1741E+01	1.3081E-02	5.8252E-03	9.0199E-04	5.7417E-03
2.1858E-02	2.1469E-02	8.5468E-02	1.6097E-01	2.8858E+00	2.6136E+00
2.4505E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5049E-01	4.1051E-01	2.3866E-01	3.3340E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1966E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.1008E-02	1.3569E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2776E-02	3.7524E-02	2.6366E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.4043E-06	1.6290E-05	6.5335E-04	3.5899E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.0337E-03	3.0426E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0675E-03	2.2642E-01

2.6170E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	3.9784E-03	2.3632E-01	2.0858E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.6438E-03	2.8595E-01
8.1692E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1265E-03	5.2103E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9092E-04	-7.2047E-04
3.6790E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.0783E-07	0.0000E+00	-1.9289E-04	2.0843E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.1993E-04
1.9205E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.3167E-04	2.4977E-03	-3.7245E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.6274E-04
3.2255E-03	-3.0524E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9478E-08	-1.1091E-03	5.1131E-03		

Central Region for Assembly C1

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Moderator

7.3710E-04	3.9732E-06	1.8509E-05	2.3148E-04	1.5214E-03	5.5940E-03
1.3157E-02	2.8534E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.6427E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6358E-02	1.1202E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.5302E-02	1.1756E-01	4.6218E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	2.8072E-04	1.1777E-03	1.0285E-01	7.8796E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1069E-05
1.4236E-03	1.9470E-01	7.6840E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.4043E-05	5.0390E-03	1.9893E-01	6.5388E-01
5.1181E-03	0.0000E+00	0.0000E+00	0.0000E+00	2.6307E-06	7.3131E-04
2.8478E-02	3.2011E-01	8.5528E-01	1.7315E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.1540E-04	8.6573E-03	6.5374E-02	4.3224E-01	1.8094E+00
3.2163E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.0134E-02	6.1149E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.9941E-03	5.4195E-02
2.7883E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.1555E-05	7.6299E-05	4.5727E-02	5.1729E-01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.0761E-05	8.7416E-02
5.1240E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.5348E-04	9.6618E-02	4.3521E-01	3.2224E-03	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	9.8292E-06	5.9193E-03	1.1811E-01
4.5430E-01	3.1510E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.7019E-04	4.9686E-03	6.1831E-02	4.5187E-01		

Cladding

1.1149E-04	5.1021E-04	7.9625E-04	7.7719E-03	7.8958E-04	1.1699E-03
2.7507E-03	5.9331E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1848E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4581E-02	2.2786E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.0427E-02	1.6020E-02	3.8477E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.1801E-08	2.2507E-07	9.8711E-04	3.7021E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.2442E-03	2.7059E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.6330E-03	2.6946E-01
1.9973E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.3586E-03	2.5938E-01	9.6244E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.3823E-02	2.6702E-01

5.3128E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-4.6327E-04	7.8944E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.6191E-05	-7.8415E-04	0.0000E+00
4.6130E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-2.4931E-04	3.1927E-03	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-4.0320E-04	0.0000E+00
2.5829E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-5.2750E-04	3.6914E-03	-2.4252E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.2433E-03	0.0000E+00
5.4136E-03	-1.7144E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-9.7041E-10	-2.6010E-03	4.1587E-03			

UO2 Fuel - 3.25% U-235

1.4538E-02	8.1279E-03	6.3941E-03	3.9285E-02	1.4800E-01	4.7104E-02	
1.6386E-01	3.7654E-01	1.3524E-02	6.1600E-03	1.1659E-03	7.4548E-03	
2.8162E-02	2.7655E-02	1.1938E-01	2.7016E-01	2.8829E+00	2.6125E+00	
2.4509E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	
3.5048E-01	4.1063E-01	2.3856E-01	3.3255E-04	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	1.7537E-01	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6200E-02	2.3821E-01	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
2.2612E-02	5.8940E-02	4.2515E-01	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	8.3939E-06	1.5243E-05	2.8943E-03	5.0975E-01	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	5.0810E-03	4.6303E-01	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.3009E-03	3.7906E-01	
4.4271E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	1.5457E-02	3.6767E-01	2.8657E-02	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.1127E-02	3.8338E-01	
9.7654E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	-3.8037E-04	7.3301E-02	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9312E-04	-1.0622E-02	
4.9513E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
5.0111E-07	0.0000E+00	-8.9069E-04	9.9869E-03	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.5659E-03	
1.0330E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	-1.9120E-03	1.2299E-02	-4.0894E-04	0.0000E+00	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.5843E-03	
1.4283E-02	-4.8203E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	-2.8979E-07	-5.0318E-03	1.3460E-02			

UO2 Fuel - 2.76% U-235 and 6% Gd<sub>2</sub>O<sub>3</sub>

1.2118E-02	7.6834E-03	6.9950E-03	6.2419E-02	2.2529E-01	2.3394E-01	
1.9532E+00	3.3374E+01	1.2393E-02	5.5321E-03	9.1789E-04	5.8249E-03	
2.2177E-02	2.2047E-02	8.0865E-02	1.6262E-01	2.8837E+00	2.6132E+00	
2.4506E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	
3.5049E-01	4.1055E-01	2.3863E-01	3.3311E-04	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	1.2067E-01	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.1654E-02	1.3981E-01	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
2.3420E-02	3.8167E-02	2.6574E-01	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	8.1213E-06	1.8792E-05	6.7498E-04	3.7546E-01	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	1.0488E-03	3.0635E-01	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0902E-03	2.2495E-01	
3.5554E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	3.9877E-03	2.4687E-01	2.7372E-02	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.8353E-03	4.0789E-01	
8.2496E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	1.0559E-03	5.4479E-02	0.0000E+00	0.0000E+00	
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.7512E-04	-7.5572E-04	
3.6783E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
4.6785E-07	0.0000E+00	-1.8558E-04	2.1869E-03	0.0000E+00	0.0000E+00	

0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.0721E-04
1.9547E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.2980E-04	2.4828E-03	-4.7526E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.3215E-04
2.9975E-03	-2.9984E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9423E-08	-6.9279E-04	5.7835E-03		

UO2 Fuel - 3.08% U-235 and 2% Gd<sub>2</sub>O<sub>3</sub>

1.2811E-02	7.9639E-03	6.6128E-03	4.6660E-02	1.7334E-01	1.2069E-01
9.4499E-01	1.1670E+01	1.3145E-02	5.9324E-03	1.0796E-03	6.8671E-03
2.5941E-02	2.5710E-02	1.0247E-01	1.9299E-01	2.8840E+00	2.6127E+00
2.4506E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5048E-01	4.1060E-01	2.3858E-01	3.3272E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1965E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0968E-02	1.3561E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2787E-02	3.7494E-02	2.6295E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.3599E-06	1.6446E-05	6.4270E-04	3.5754E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.0246E-03	3.0377E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0571E-03	2.2693E-01
2.6677E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	3.9540E-03	2.3688E-01	2.1076E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.5477E-03	2.8599E-01
8.1703E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1229E-03	5.2101E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.8992E-04	-7.2450E-04
3.6979E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.9409E-07	0.0000E+00	-1.8961E-04	2.0814E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.1709E-04
1.9159E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.2819E-04	2.4939E-03	-3.7969E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.5747E-04
3.2210E-03	-3.0838E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9245E-08	-1.0948E-03	5.1457E-03		

Central Region for Assembly C2

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Moderator

7.3873E-04	3.9734E-06	1.8537E-05	2.3157E-04	1.5217E-03	5.5948E-03
1.3120E-02	2.8525E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.6433E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.6335E-02	1.1202E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.5290E-02	1.1755E-01	4.6233E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	2.8059E-04	1.1776E-03	1.0311E-01	7.8786E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1067E-05
1.4272E-03	1.9481E-01	7.6829E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.4139E-05	5.0419E-03	1.9903E-01	6.5380E-01
5.2331E-03	0.0000E+00	0.0000E+00	0.0000E+00	2.6384E-06	7.3173E-04
2.8492E-02	3.2019E-01	8.5652E-01	1.7331E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.1554E-04	8.6613E-03	6.5389E-02	4.2924E-01	1.8088E+00
3.2168E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.0118E-02	6.1151E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.9891E-03	5.4189E-02
2.7897E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.1548E-05	7.6289E-05	4.5854E-02	5.1724E-01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.0998E-05	8.7472E-02
5.1234E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.5378E-04	9.6681E-02	4.3516E-01	3.2960E-03	0.0000E+00



0.0000E+00	0.0000E+00	0.0000E+00	9.8358E-06	5.9232E-03	1.1814E-01
4.5495E-01	3.1583E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.7070E-04	4.9692E-03	6.1145E-02	4.5182E-01		

Cladding

1.1048E-04	5.1021E-04	7.9693E-04	7.7732E-03	7.8948E-04	1.1701E-03
2.7428E-03	5.9312E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1849E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4580E-02	2.2785E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.0417E-02	1.6021E-02	3.8483E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.1882E-08	2.2502E-07	9.8996E-04	3.7013E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.2450E-03	2.7059E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.6356E-03	2.6946E-01
2.0444E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.3588E-03	2.5957E-01	9.6529E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.3589E-02	2.6699E-01
5.3142E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-4.6284E-04	7.8940E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.6172E-05	-7.8384E-04
4.6058E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-2.5003E-04	3.1924E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-4.0345E-04
2.5837E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-5.2837E-04	3.6917E-03	-2.4819E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.2433E-03
5.3770E-03	-1.7187E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-9.7045E-10	-2.5588E-03	4.1631E-03		

UO2 Fuel - 3.25% U-235

1.4538E-02	8.1287E-03	6.4001E-03	3.9279E-02	1.4789E-01	4.7108E-02
1.6339E-01	3.7666E-01	1.3528E-02	6.1608E-03	1.1664E-03	7.4572E-03
2.8159E-02	2.7660E-02	1.1903E-01	2.7007E-01	2.8835E+00	2.6125E+00
2.4509E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5048E-01	4.1063E-01	2.3856E-01	3.3255E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.7536E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6189E-02	2.3821E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2612E-02	5.8936E-02	4.2523E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.4492E-06	1.5242E-05	2.9011E-03	5.0966E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.0838E-03	4.6295E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.3079E-03	3.7906E-01
4.5096E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.5458E-02	3.6795E-01	2.8708E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0747E-02	3.8333E-01
9.7645E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.7957E-04	7.3299E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9301E-04	-1.0620E-02
4.9470E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.0487E-07	0.0000E+00	-8.9280E-04	9.9877E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.5667E-03
1.0332E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-1.9140E-03	1.2300E-02	-4.1584E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.5850E-03
1.4241E-02	-4.8243E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.8978E-07	-4.9826E-03	1.3464E-02		

UO2 Fuel - 2.76% U-235 and 6% Gd<sub>2</sub>O<sub>3</sub>

1.2115E-02	7.6979E-03	7.0093E-03	6.2787E-02	2.2698E-01	2.3385E-01
1.9492E+00	3.3572E+01	1.2398E-02	5.5492E-03	9.1871E-04	5.8331E-03
2.2236E-02	2.2060E-02	8.0822E-02	1.6298E-01	2.8847E+00	2.6132E+00
2.4505E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5049E-01	4.1055E-01	2.3863E-01	3.3311E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.2068E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.1630E-02	1.3978E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.3416E-02	3.8167E-02	2.6588E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.1915E-06	1.8759E-05	6.7826E-04	3.7700E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.0511E-03	3.0741E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0922E-03	2.2495E-01
3.5618E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	3.9900E-03	2.4685E-01	2.7260E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.8158E-03	4.0865E-01
8.2497E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.0548E-03	5.4483E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.7492E-04	-7.5036E-04
3.6728E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.7256E-07	0.0000E+00	-1.8651E-04	2.1919E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.0789E-04
1.9584E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.3052E-04	2.4833E-03	-4.7610E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.3264E-04
2.9957E-03	-2.9872E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9440E-08	-6.9032E-04	5.7754E-03		

UO2 Fuel - 3.08% U-235 and 2% Gd<sub>2</sub>O<sub>3</sub>

1.2808E-02	7.9703E-03	6.6319E-03	4.7071E-02	1.7567E-01	1.2056E-01
9.4445E-01	1.1760E+01	1.3151E-02	5.9398E-03	1.0810E-03	6.8829E-03
2.6016E-02	2.5739E-02	1.0245E-01	1.9354E-01	2.8849E+00	2.6127E+00
2.4505E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5048E-01	4.1060E-01	2.3858E-01	3.3272E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1965E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0950E-02	1.3559E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2784E-02	3.7494E-02	2.6317E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.4351E-06	1.6437E-05	6.4734E-04	3.5896E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.0283E-03	3.0479E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0633E-03	2.2692E-01
2.6708E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	3.9604E-03	2.3688E-01	2.0943E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.5428E-03	2.8643E-01
8.1700E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1219E-03	5.2102E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.8978E-04	-7.2230E-04
3.6897E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.9920E-07	0.0000E+00	-1.9100E-04	2.0865E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.1827E-04
1.9208E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.3020E-04	2.4954E-03	-3.8013E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.5887E-04
3.2205E-03	-3.0660E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9292E-08	-1.0939E-03	5.1292E-03		

Central Region for Assembly C3

Moderator

8.0907E-04	7.7827E-06	3.8969E-05	4.6335E-04	3.0614E-03	1.1225E-02
2.6225E-02	5.7072E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	6.0813E-02	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.9716E-02	1.2062E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.7125E-02	1.2621E-01	4.9791E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.0091E-04	1.2645E-03	1.1175E-01	8.4685E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1871E-05
1.5468E-03	2.1039E-01	8.2540E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.7028E-05	5.4447E-03	2.1510E-01	7.0374E-01
5.8010E-03	0.0000E+00	0.0000E+00	0.0000E+00	2.8626E-06	7.9019E-04
3.0790E-02	3.4414E-01	9.2330E-01	1.8695E-01	0.0000E+00	0.0000E+00
0.0000E+00	2.3283E-04	9.3602E-03	7.0283E-02	4.5733E-01	1.9423E+00
3.4657E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	3.2285E-02	6.5821E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	9.6354E-03	5.8178E-02
3.0051E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.2374E-05	8.1871E-05	4.9730E-02	5.5599E-01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	8.7881E-05	9.4498E-02
5.5043E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	4.9031E-04	1.0462E-01	4.6826E-01	3.6540E-03	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	1.0628E-05	6.4094E-03	1.2693E-01
4.9033E-01	3.4214E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
8.3408E-04	5.3411E-03	6.4756E-02	4.8593E-01		

Cladding

1.0593E-04	5.1020E-04	7.9880E-04	7.7801E-03	7.8783E-04	1.1697E-03
2.7318E-03	5.9181E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1852E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.4572E-02	2.2772E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.0379E-02	1.6022E-02	3.8500E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	5.2170E-08	2.2428E-07	9.9783E-04	3.6973E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.2523E-03	2.7059E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.6451E-03	2.6948E-01
2.1121E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.3369E-03	2.5983E-01	9.7367E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.3259E-02	2.6689E-01
5.3202E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-4.6114E-04	7.8889E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.6098E-05	-7.7989E-04
4.5882E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-2.5202E-04	3.1919E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-4.0584E-04
2.5869E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-5.3144E-04	3.6865E-03	-2.5631E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.2383E-03
5.3254E-03	-1.7319E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-9.6648E-10	-2.4991E-03	4.1767E-03		

UO2 Fuel - 3.25% U-235

1.4546E-02	8.1473E-03	6.4159E-03	3.9530E-02	1.4940E-01	4.7105E-02
1.6264E-01	3.7624E-01	1.3546E-02	6.1823E-03	1.1678E-03	7.4735E-03
2.8210E-02	2.7652E-02	1.1847E-01	2.6944E-01	2.8860E+00	2.6126E+00
2.4508E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5048E-01	4.1063E-01	2.3856E-01	3.3255E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.7536E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.6120E-02	2.3806E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2.2607E-02	5.8829E-02	4.2538E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.6677E-06	1.5222E-05	2.9200E-03	5.1042E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	5.1115E-03	4.6343E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.3496E-03	3.7911E-01
4.6454E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.5400E-02	3.6842E-01	2.8883E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0126E-02	3.8311E-01
9.7632E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.7422E-04	7.3244E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9246E-04	-1.0565E-02
4.9379E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.1976E-07	0.0000E+00	-8.9863E-04	9.9989E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-1.5753E-03
1.0347E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-1.9272E-03	1.2288E-02	-4.2700E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.5740E-03
1.4174E-02	-4.8411E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.8853E-07	-4.9035E-03	1.3483E-02		

UO2 Fuel - 2.27% U-235 and 8% Gd<sub>2</sub>O<sub>3</sub>

1.1717E-02	7.5116E-03	7.1006E-03	6.9360E-02	2.4398E-01	2.7792E-01
2.2810E+00	4.3921E+01	1.2005E-02	5.3075E-03	7.3764E-04	4.6752E-03
1.7937E-02	1.7701E-02	6.2584E-02	1.2986E-01	2.8875E+00	2.6141E+00
2.4506E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5050E-01	4.1044E-01	2.3873E-01	3.3390E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.2118E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.1955E-02	1.4185E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.3717E-02	3.8513E-02	2.6747E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.2454E-06	1.9782E-05	6.9768E-04	3.8507E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.0661E-03	3.0793E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1086E-03	2.2352E-01
3.9864E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	3.9689E-03	2.4955E-01	3.0355E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	4.2823E-03	4.6703E-01
8.2865E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.0222E-03	5.5653E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.6795E-04	-7.5844E-04
3.6580E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.7716E-07	0.0000E+00	-1.8550E-04	2.2393E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.0429E-04
1.9739E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.3119E-04	2.4673E-03	-5.1584E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.1281E-04
2.9466E-03	-2.9342E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9270E-08	-5.7228E-04	6.0703E-03		

UO2 Fuel - 3.08% U-235 and 2% Gd<sub>2</sub>O<sub>3</sub>

1.2797E-02	7.9819E-03	6.6562E-03	4.7349E-02	1.7696E-01	1.2065E-01
9.2824E-01	1.1692E+01	1.3170E-02	5.9534E-03	1.0828E-03	6.9010E-03
2.6061E-02	2.5728E-02	1.0186E-01	1.9313E-01	2.8876E+00	2.6128E+00
2.4504E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00	2.4338E+00
3.5048E-01	4.1060E-01	2.3858E-01	3.3272E-04	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1965E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	3.0903E-02	1.3556E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2.2779E-02	3.7494E-02	2.6344E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	8.6816E-06	1.6419E-05	6.5326E-04	3.5985E-01
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	1.0339E-03	3.0516E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0713E-03	2.2693E-01

2.7429E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	3.9450E-03	2.3685E-01	2.1064E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	6.3314E-03	2.8606E-01
8.1681E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	1.1192E-03	5.2104E-02	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.8941E-04	-7.1826E-04
3.6793E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.1594E-07	0.0000E+00	-1.9276E-04	2.0907E-03	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-3.1998E-04
1.9243E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	-3.3272E-04	2.4920E-03	-3.9024E-04	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-8.5577E-04
3.1984E-03	-3.0820E-03	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	-2.9172E-08	-1.0617E-03	5.1440E-03		

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