

### Four cell fast reactor results.

Pin cells		Annular cells	
UOX fuel		UOX coolant	
diam.	0.5780 cm	pitch	0.9536 cm
temp.	294.0 K	temp.	294.0 K
nuclide	N (#/b/cm <sup>2</sup> )	nuclide	N (#/b/cm <sup>2</sup> )
U-235	$1.7670 \times 10^{-4}$	Na-23	$1.0380 \times 10^{-2}$
U-238	$2.4364 \times 10^{-2}$	Cr-52	$4.9730 \times 10^{-3}$
O-16	$4.9082 \times 10^{-2}$	Fe-56	$1.7280 \times 10^{-2}$
		Ni-58	$3.6270 \times 10^{-3}$
PuO <sub>2</sub> fuel		PuO <sub>2</sub> coolant	
diam.	0.5780 cm	pitch	0.9536 cm
temp.	294.0 K	temp.	294.0 K
nuclide	N (#/b/cm <sup>2</sup> )	nuclide	N (#/b/cm <sup>2</sup> )
Pu-239	$1.2747 \times 10^{-2}$	Na-23	$1.0380 \times 10^{-2}$
Pu-240	$7.6481 \times 10^{-3}$	Cr-52	$4.9730 \times 10^{-3}$
Pu-241	$5.0987 \times 10^{-3}$	Fe-56	$1.7280 \times 10^{-2}$
O-16	$5.0987 \times 10^{-2}$	Ni-58	$3.6270 \times 10^{-3}$

Table 1: Dimensions and composition of a fast reactor fueled with both uranium oxide and plutonium oxide and cooled with sodium. The fuel rod is modeled by smearing steel throughout the sodium. This reactor definition is informed by the MOX reactor in (Palmiotti et al., 1995).

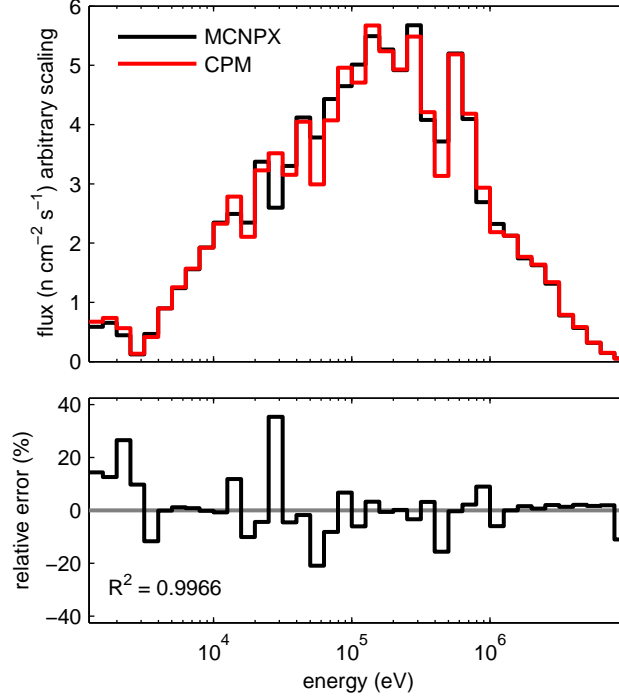


Figure 1: Comparison to MCNPX of spectral flux in the UOX fuel. The top graph compares the fuel flux from our method (“CPM”) to MCNPX results. The bottom graph provides the error between our method and MCNPX. The coefficient of determination between the results is 0.9966.

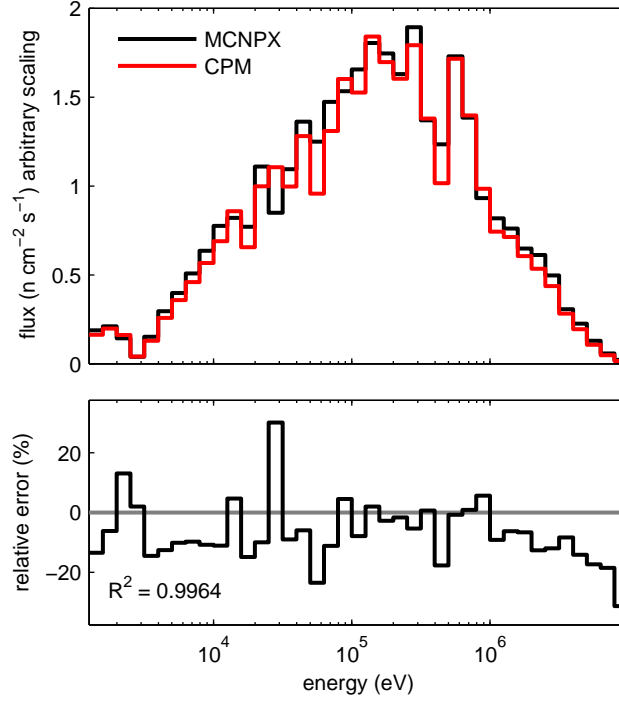


Figure 2: Comparison to MCNPX of spectral flux in the plutonium fuel. The top graph compares the fuel flux from our method (“CPM”) to MCNPX results. The bottom graph provides the error between our method and MCNPX. The coefficient of determination between the results is 0.9966.

nuclide	reaction	MCNPX	CPM	error (%)
U-235	fission	1380	1411	2.25
	capture	401	422	5.24
U-238	fission	4108	4086	-0.54
	capture	26684	27307	2.33
Pu-239	fission	30933	28908	-6.55
	capture	8044	7508	-6.66
Pu-240	fission	0	3726	-
	capture	4951	4533	-8.44
Pu-241	fission	17265	16094	-6.78
	capture	2980	2769	-7.08

Table 2: Comparison to MCNPX of one-group reaction rates in a sodium fast reactor. The absorption rates for the fuel isotopes are provided. Our method is noted as “CPM”. These reaction rates cover the energy range from 5 eV to 10 MeV. The numbers are normalized to 100,000 total absorptions in the system.

## References

Palmiotti, G., Hill, R., Wade, D., 1995. Physics of Plutonium Recycling. Tech. rep., Nuclear Energy Agency.