

# Effect of Delayed Neutron Data Changes on Kinetics Parameters of Two ZPR Assemblies

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# ZPR-6/7 $\beta_{\text{eff}}$

## Dependence on ENDF/B Version

Cross Sections	Delayed Data	$\beta_{\text{eff}}$	Difference
ENDF/B V	ENDF/B V	3.36E-3	-2.4%
ENDF/B VI	ENDF/B VI	3.442E-3	Reference
ENDF/B VI	ENDF/B VII-04	3.442E-3	0.0%
ENDF/B VI	ENDF/B VII-05	3.444E-3	0.1%

Isotopic Contributions in ENDF/B VI: 2% U-235, 50% U-238, 43% Pu-239

~0.1% Change in Isotopic Contributions From VI to VII Delayed Data

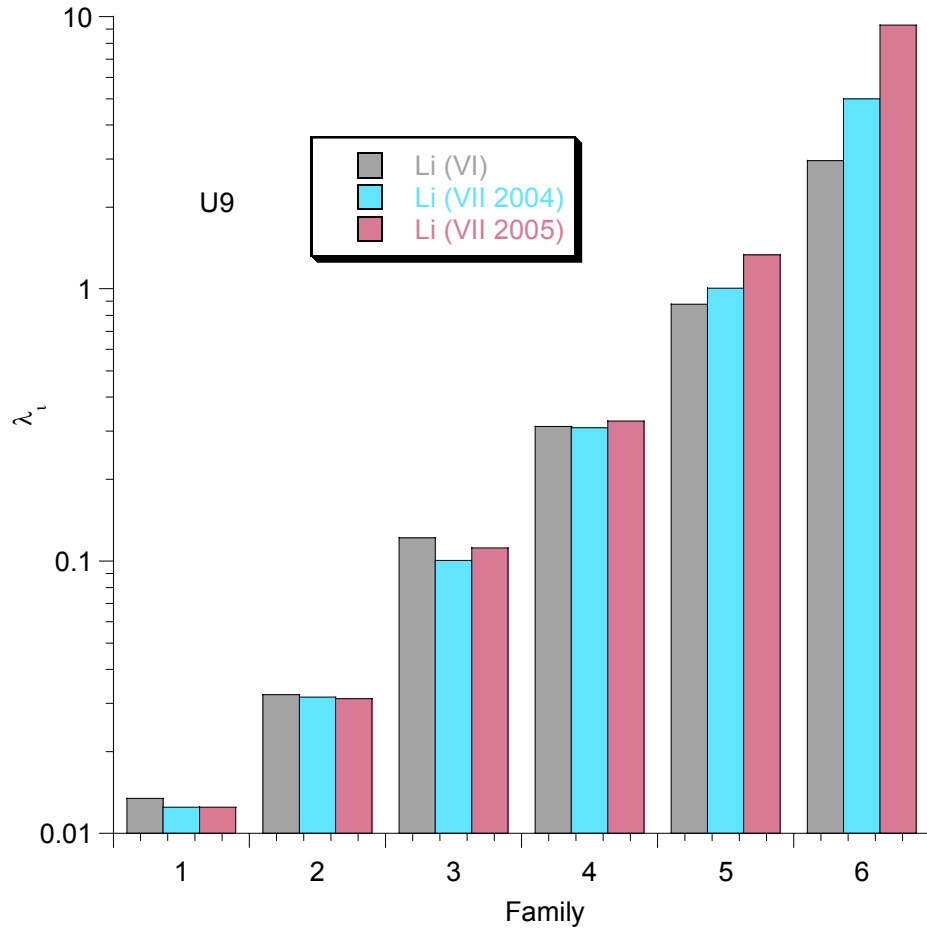
# U9 (ZPR-9/36,ZPR-6/9) $\beta_{\text{eff}}$ Dependence on ENDF/B Version

Cross Sections	Delayed Data	$\beta_{\text{eff}}$	Difference
ENDF/B VI	ENDF/B VI	7.222E-3	Reference
ENDF/B VI	ENDF/B VII-2004	7.219E-3	-0.05%
ENDF/B VI	ENDF/B VII-2005	7.227E-3	0.06%

Isotopic Contributions in ENDF/B VI: U-235 53%; U-238 47%

Change in Isotopic Contributions From VI to VII-2005 Delayed Data:  
U-234 -0.08%; U-235 0.10%; U-236 0.26%; U-238 0.03%

# Decay Constants Changed Markedly



Effective Delayed  
Neutron Lifetime

Data	Z6-7	U9
VI	10.1	9.2
VII04	13.5	11.6
VII05	10.7	9.1

# ZPR-6/7 Kinetics Parameters

## % Change From ENDF/B VI to VII

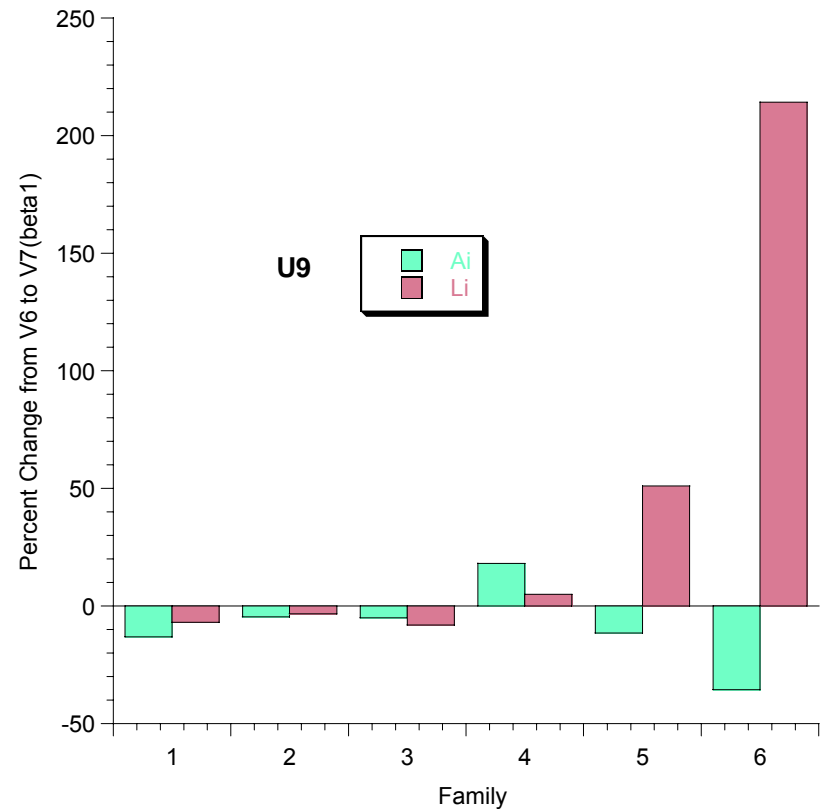
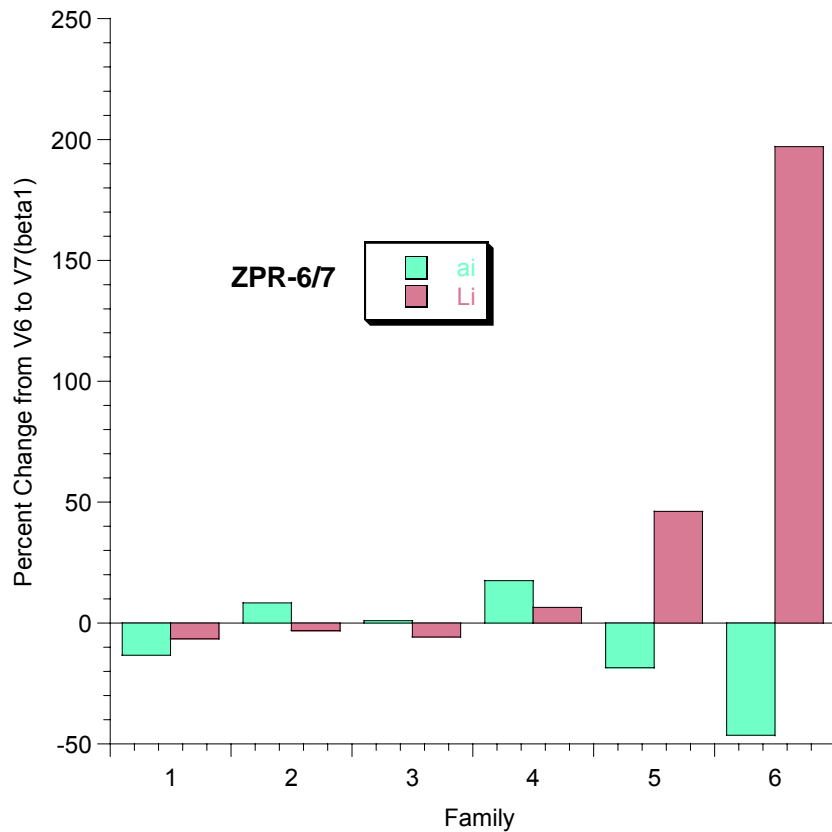
Family	$\beta_i$		$a_i$		$\lambda_i$		$\beta_i/(1+3600\lambda_i)$	
	2004	2005	2004	2005	2004	2005	2004	2005
1	42.8	-13.3	42.8	-13.4	-6.5	-6.4	52.4	-7.5
2	34.0	8.4	34.0	8.3	-1.8	-3.0	36.4	11.7
3	0.5	1.1	0.5	1.1	-19.8	-5.7	25.1	7.2
4	-1.8	17.6	-1.8	17.5	-9.0	6.5	7.8	10.4
5	-19.7	-18.6	-19.7	-18.6	-12.9	46.3	-7.8	-44.3
6	-27.9	-46.3	-27.9	-46.3	26.4	197.1	-43.0	-81.9
family sum	0.0	0.1					33.2	6.0

# U9 Kinetics Parameters

## % Change From ENDF/B VI to VII

Family	$\beta_i$		$a_i$		$\lambda_i$		$\beta_i/(1+3600\lambda_i)$	
	2004	2005	2004	2005	2004	2005	2004	2005
1	39.5	-13.0	39.6	-13.1	-6.8	-6.9	49.5	-6.8
2	23.5	-4.4	23.6	-4.5	-1.8	-3.2	25.8	-1.3
3	4.2	-4.9	4.3	-4.9	-17.6	-8.1	26.4	3.5
4	5.1	18.1	5.2	18.1	-1.1	5.0	6.2	12.5
5	-24.5	-11.3	-24.4	-11.3	14.1	51.2	-33.8	-41.3
6	-25.6	-35.4	-25.6	-35.5	68.1	214.1	-55.7	-79.4
family sum	0.0	0.1					26.1	-1.1

# Percent Change in $a_i$ and $\lambda_i$ From ENDF/B VI to VII(beta1)



# Conclusions

- $a_i$ - $\lambda_i$  sets changed remarkably in 2004 and again in 2005.
  - $a_i$  changed up to 46%,  $\lambda_i$  changed up to factor of 2.
  - $a_i$ - $\lambda_i$  set used to unfold dynamic reactivity measurements at ZPPR used ENDF/B  $\lambda_i$  and fit  $a_i$  to rod drop.
- But sums over families changed relatively little.
  - $\beta_{\text{eff}}$  virtually unchanged (ZPPR conversion to  $\Delta k$ ).
  - $L_d$  and 1hour-to- $\Delta k$  conversion changed  $\sim 30\%$  in 2004 but 1%-6% in 2005 (ZPR conversion to  $\Delta k$ ).
- Changes in cross sections could affect  $\beta_{\text{eff}}$  .