BETA-DECAY and DECAY HEAT
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Remarks on decay heat calculations

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Major contributors to the beta decay heat, ^{235}U thermal

0.1 s		^{97}Sr	^{96}Sr	^{97m}Y	^{95}Rb	24 %
	⟨E⟩ Jeff	2456	1972	2433	2829	
	⟨E⟩ Jendl	2285	1970	2355	3102	
		- 7 %	=	- 3 %	+ 10 %	
0.3 s		^{96}Sr	^{97}Sr	^{97m}Y	^{142}Cs	23 %
	⟨E⟩ Jeff	1972	2456	2433	2899	
	⟨E⟩ Jendl	1970	2285	2355	2449	
		=	- 7 %	- 3 %	- 18 %	
1.0 s		^{96}Sr	^{97m}Y	^{142}Cs	^{99}Zr	20 %
	⟨E⟩ Jeff	1972	2433	2899	1539	
	⟨E⟩ Jendl	1970	2355	2449	1710	
		=	- 3 %	- 18 %	+ 11 %	
3.0 s		^{96}Y	^{92}Rb	^{99}Zr	^{142}Cs	20 %
	⟨E⟩ Jeff	3205	2875	1539	2899	
	⟨E⟩ Jendl	2657	3499	1710	2449	
		- 20 %	+ 22 %	+ 11 %	- 18 %	
10. s		^{96}Y	^{100}Nb	^{92}Rb	^{101}Nb	25 %
	⟨E⟩ Jeff	3205	2493	2875	1863	
	⟨E⟩ Jendl	2657	2480	3499	1686	
		- 20 %	=	+ 22 %	- 10 %	
30. s		^{98}Nb	^{95}Sr	^{141}Cs	^{135}Te	20 %
	⟨E⟩ Jeff	1965	2208	1935	2442	
	⟨E⟩ Jendl	1628	2210	1940	2084	
		- 21 %	=	=	- 17 %	
100. s		^{140}Cs	^{91}Rb	^{144}La	^{98}Nb	23 %
	⟨E⟩ Jeff	1964	1612	1382	1965	
	⟨E⟩ Jendl	1752	1500	1380	1628	
		- 12 %	- 7 %	=	- 21 %	
300. s		^{137}Xe	^{90}Rb	^{139}Cs	^{95}Y	27 %
	⟨E⟩ Jeff	1695	2049	1640	1437	
	⟨E⟩ Jendl	1700	1992	1640	1440	
		=	- 3 %	=	=	
1000. s		^{94}Y	^{139}Cs	^{95}Y	^{102}Tc	33 %
	⟨E⟩ Jeff	1814	1640	1437	1945	
	⟨E⟩ Jendl	1810	1640	1440	1420	
		=	=	=	- 37 %	

Pandemonium ?

	E(last level)	Q_β	E / Q_β	$Q_{\beta-n}$	$I_{\beta-n}$
^{97}Sr	2558	7470	0.34	1488	< 0.05
^{96}Sr	1983	5416	0.37	197	0
^{97m}Y	2508	6680	0.38	1113	< 0.08
^{95}Rb	4661	9296	0.50	4915	8.73
^{142}Cs	5280	7307	0.72	1140	0.09
^{99}Zr	1976	4558	0.43		
^{96}Y	6231	7100	0.88		
^{92}Rb	7363	8100	0.91	802	0.01
^{100}Nb	3129	6245	0.50		
^{101}Nb	1099	4569	0.24		

Comparison between the JENDL and JEFF libraries

^{92}Rb	JEFF-3.1 (2003)	JENDL-3.2(1999)	δ
Q_β	8105	8100	
E_β	2875	3499	+ 22 %
E_γ	1750	520	high
δQ	0.27 %		

^{96}Y	JEFF-3.1 (1998)	JENDL-3.2(1999)	δ
Q_β	7100	7100	
E_β	3205	2657	- 20 %
E_γ	80	1206	high
δQ	0.0056%		
	Note: 96 % β^- to the g.s.!		

^{142}Cs	JEFF-3.1 (1991)	JENDL-3.2(1999)	δ
Q_β	7317	7307	
E_β	2899	2449	- 18 %
E_γ	675	1787	high
δQ	- 1.1 %		

Comparison between the JENDL and JEFF libraries and experimental results

^{140}Cs		JEFF-3.1 (1995)	JENDL-3.2(1999)	δ	Greenwood	Rudstam
	Q_β	6370	6220			
	E_β	1964	1752	- 11 %	1910	1860
	E_γ	1675	2216	32 %	1818	1270
	δQ	0.21 %				
^{144}La		JEFF-3.1 (1989)	JENDL-3.2(1999)	δ	Greenwood	Rudstam
	Q_β	5600	5541			
	E_β	1382	1380	=	986	
	E_γ	2330	2330	=	3085	2240
	δQ	0.87 %				

Case of ^{97g,m,n}Y

^{97g}Y		JEFF-3.1	JENDL-3.2	UKPADD-6.5
	Q_β	6680	6688	6689
	E_β	2228	2355	2135
	E_γ	2228	1468	1846

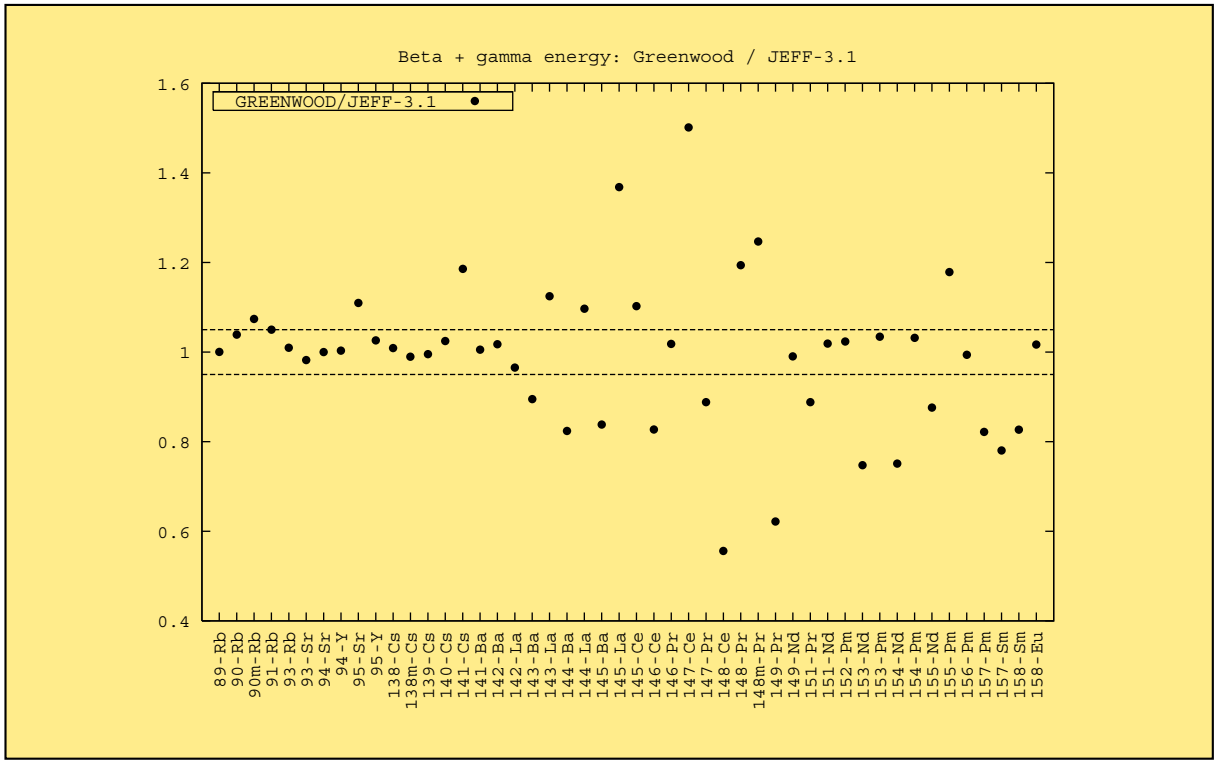
^{97m}Y		JEFF-3.1	JENDL-3.2	UKPADD-6.5
	Q_β	7356	7350	7357
	E_β	2433	2200	2318
	E_γ	2433	2680	2111

^{97n}Y		JEFF-3.1	JENDL-3.2	UKPADD-6.5
	Q_β	10212		10212
	E_β	681		121
	E_γ	2965		2803

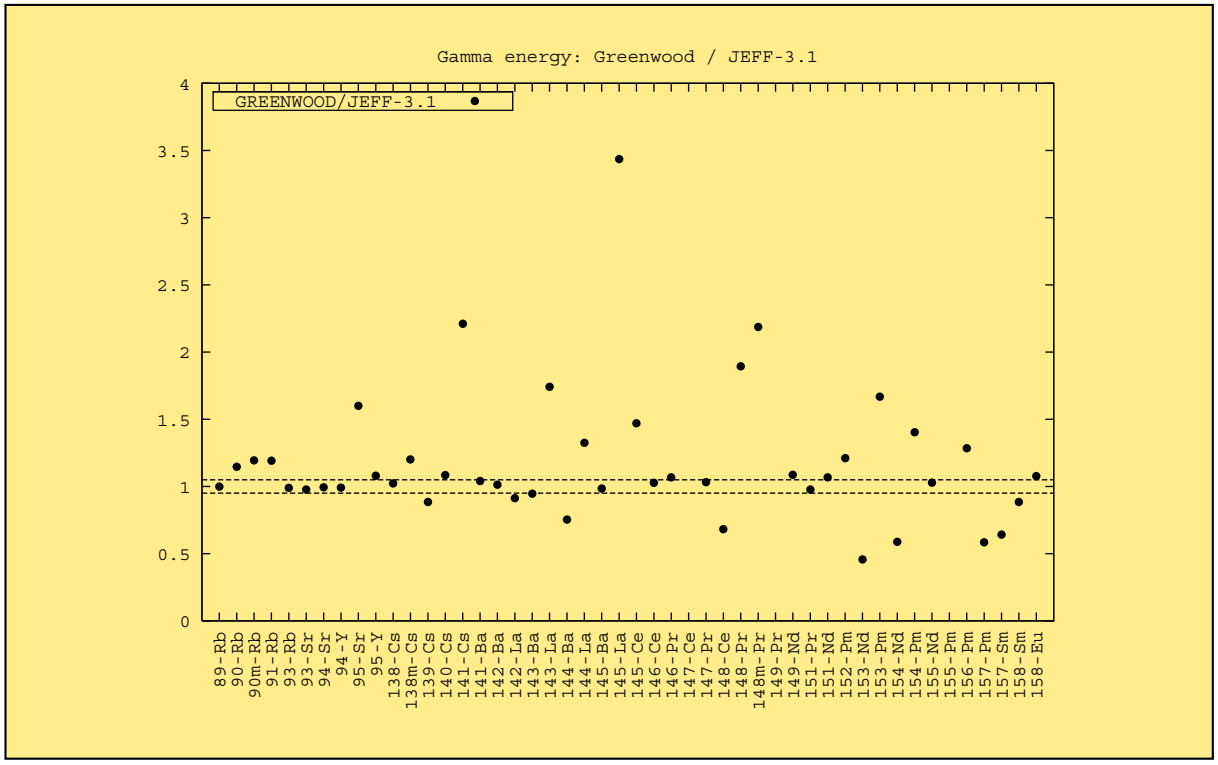
Major contributors to the beta decay heat, ^{239}Pu thermal

0.1 s		^{97m}Y	^{103}Nb	^{97}Sr	^{96}Sr	22 %
	⟨E⟩ Jeff	2433	1843	2456	1972	
	⟨E⟩ Jendl	2200	2111	2265	1970	
		- 11 %	+ 15 %	- 7 %	=	
0.3 s		^{97m}Y	^{103}Nb	^{96}Sr	^{99}Zr	22 %
	⟨E⟩ Jeff	2433	1843	1972	1539	
	⟨E⟩ Jendl	2200	2111	1970	1710	
		- 11 %	+ 15 %	=	+ 11 %	
1.0 s		^{97m}Y	^{103}Nb	^{99}Zr	^{102}Nb	22 %
	⟨E⟩ Jeff	2433	1843	1539	2402	
	⟨E⟩ Jendl	2200	2111	1710	2832	
		- 11 %	+ 15 %	+ 11 %	+ 18 %	
3.0 s		^{99}Zr	^{100}Nb	^{96}Y	^{102}Nb	19 %
	⟨E⟩ Jeff	1539	2493	3205	2402	
	⟨E⟩ Jendl	1710	2480	2656	2832	
		+ 11 %	=	- 21 %	+ 18 %	
10. s		^{100}Nb	^{101}Nb	^{96}Y	^{100}Zr	25 %
	⟨E⟩ Jeff	2493	1863	3205	1307	
	⟨E⟩ Jendl	2480	1686	2656	1114	
		=	- 10 %	- 21 %	- 17 %	
30. s		^{98}Nb	^{99}Nb	^{95}Sr	^{106}Tc	19 %
	⟨E⟩ Jeff	1965	1514	2208	1943	
	⟨E⟩ Jendl	1628	1275	2210	1692	
		- 21 %	- 19 %	=	- 15 %	
100. s		^{140}Cs	^{103}Mo	^{98}Nb	^{103}Tc	22 %
	⟨E⟩ Jeff	1964	1316	1965	981	
	⟨E⟩ Jendl	1752	1120	1628	704	
		- 12 %	- 18 %	- 21 %	- 39 %	
300. s		^{137}Xe	^{102}Tc	^{103}Tc	^{139}Cs	25 %
	⟨E⟩ Jeff	1695	1945	981	1640	
	⟨E⟩ Jendl	1700	1420	704	1640	
		=	- 37 %	- 39 %	=	
1000. s		^{102}Tc	^{139}Cs	^{104}Tc	^{94}Y	32 %
	⟨E⟩ Jeff	1945	1640	1595	1814	
	⟨E⟩ Jendl	1420	1640	1403	1810	
		- 37 %	=	- 14 %	=	

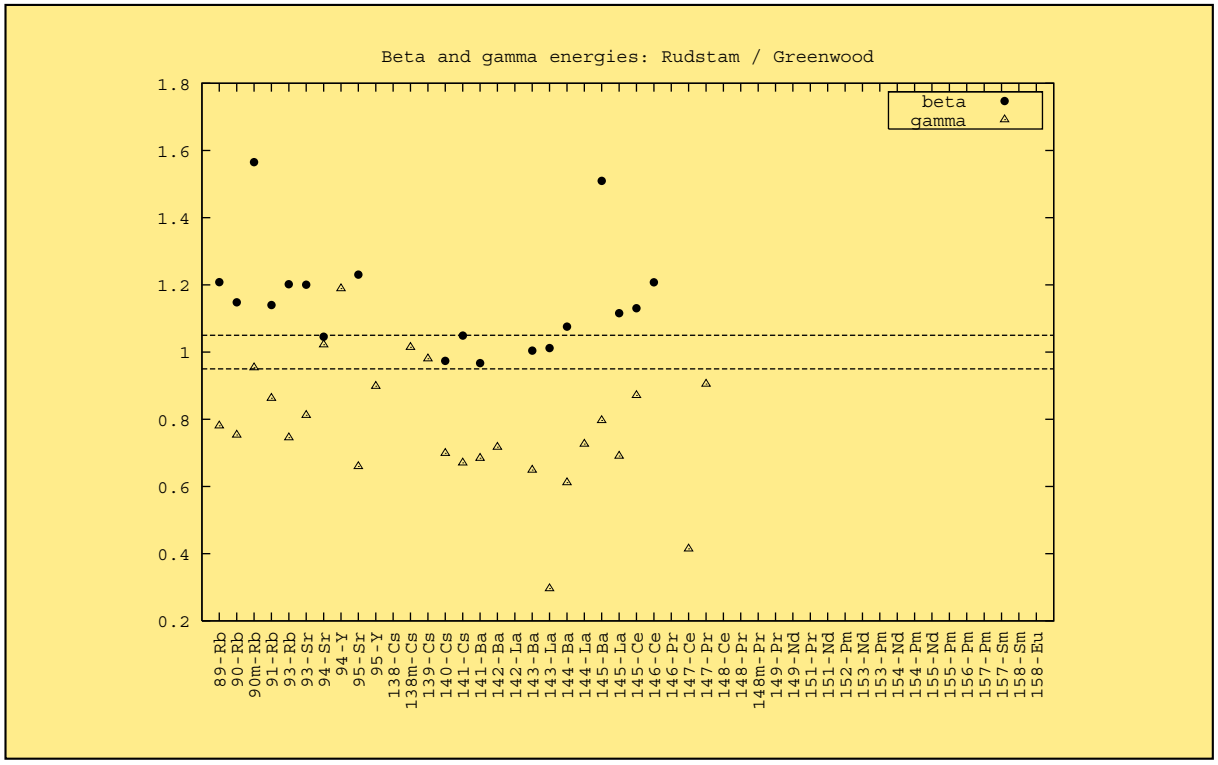
Comparison between Greenwood's and JEFF-3.1 beta + gamma average energy



Comparison between Greenwood's and JEFF-3.1 gamma average energy



Comparison between Greenwood's and Rudstam's beta and gamma average energies



Decay heay including Greenwood's average energies