Request: Better knowledge of Branching ratio and multipolarities/mixing ratios for 238U up to 1.3 MeV of excitation energy.

This request concerns the work done with the experimental prompt gamma ray spectroscopy method to infer (n,xn) reaction cross sections. The method relies on a good structure knowledge and it has been noticed that, for the case of 238U, the structure information is sometimes partial or wrong that leads to inaccurate (n,xn) cross sections determination or irrelevant comparison with theoretical models for the (n,xn g) cross sections.

Branching ratio:

Some differences are observed between our measurement and the value present in ENSDF. See "Meeting Minutes for the Informal Work Meeting on Inelastics Gammas", G.PA. Nobre, D.A. Brown, L. Bernstein (03/2019)

In the table below, the gammas for which BR have to be checked are highlighted in blue.

Internal conversion coefficients:

We have noticed that in RIPL, if the multipolarity or the mixing ratio of a gamma transition is not known in ENSDF, some assumptions are done for the IC coefficient calculation. Sometimes these assumptions (for instance the mixing ratio is assumed to be equal to 1 for M1+E2 transitions) lack experimental support. It is not always possible with BrIcc v2.3S, for example, to find what assumptions give the IC value present in RIPL.

Thus it seems relevant to try to fill the missing information (multipolarities and mixing ratios) with measured values.

In the table below, the interesting gammas for which multipolarity are missing are highlighted in green.

-> The levels, for which new information (BR, Mult.) are required, are highlighted in yellow.

ADOPTED LEVELS, GAMMAS for 238U

Authors: E. Browne, J. K. Tuli Citation: Nucl. Data Sheets 127, 191 (2015) Cutoff date: 1-Jun-2014

Full ENSDF file

Q(β-)=-147.4 keV 12 S(n)= 6154.3 keV 13 S(p)= 7507 keV 13 Q(α)= 4269.7 keV 29 Reference: 2012WA38

E(level) (keV)	XREF	Jπ(level)	T1/2(level)	E(γ) (keV)	I(γ)	M(γ)	Final level	
0.0	ABCDEFGHI	0+	4.468×109 y 6 % α = 100 % SF = 5.45E-5 7					
44.916 13	ABCDEFGHI	2+	206 ps 3	44.915 13	100	E2	0.0	0+
148.38 3	ABCDE GH	4+		103.50 4	100	[E2]	44.916	2+
307.18 8	ABCDE H	6+		159.018 16	100	[E2]	148.38	4+
518.1 3	CDE	8+	23 ps 3	210.6 4	100	[E2]	307.18	6+
680.11 4	A CDEF HI	1-	35 fs +19-9	635.3 3	100.0 20	[E1]	44.916	2+
				680.2 5	79 4	[E1]	0.0	0+
731.93 3	A CDEF H	3-		51.8			680.11	1-
				583.55 3	81.4 16	E1	148.38	4+
				686.99 3	100.0 20	[E1]	44.916	2+
775.9 4	CD	10+	9.0 ps 10	257.8 4	100	[E2]	518.1	8+
826.64 11	A CDE H	5-		519.46 8	50 3	[E1]	307.18	6+
				678.3 3	100 6	[E1]	148.38	4+
927.21 19	CD F	0+		882.3 6	100	[E2]	44.916	2+
930.55 9	A CDEF H	(1-)		251.2 7	13.1 14		680.11	1-
				885.46 10	100 4	[E1]	44.916	2+
				931.1 2	25.2 13	[E1]	0.0	0+
950.12 20	A CD F	2-		218.1 3	53 6		731.93	3-
				270.1 4	48 8		680.11	1-
				905.5 5	100 6	[E1]	44.916	2+
966.13 4	A CD F	2+	2.4 ps +17-7	234.5 10	13.9 14	[E1]	731.93	3-
				286.3 10	8.1 7	[E1]	680.11	1-
				818.06 13	100 4	[E2]	148.38	4+
				921.19 3	60 3	E2+M1+E0	44.916	2+
				966.9 3	27.3 14	[E2]	0.0	0+
966.31 21	CD	7-		449			518.1	8+
				659.1 2	100 14		307.18	6+
997.23 24	CD H	0+		952.06 5			44.916	2+
				997.23 24		E0	0.0	0+
997.58 7	A CDEF H	3-		67.1			930.55	(1-)

				318.0 10	8.0 4	[E2]	680.11	1-
				849.1 4	100 3	E1	148.38	4+
				952.65 7	56.8 13	[E1]	44.916	2+
1028	CD	4-		78.1 4	64 42		950.12	2-
				295.86 6	<190		731.93	3-
				879.63 11	100 6		148.38	4+
1037.25 7	A CDEF H	2+	1.13 ps 12	305.5 6	11.8 5	E1	731.93	3-
				357.5 6	9.5 4	E1	680.11	1-
				888.9 3	71.7 15	E2	148.38	4+
				992.32 7	72.9 15	E2+M1+E0	44.916	2+
				1037.3 2	100.0 21	E2	0.0	0+
1056.38 21	CD G	4+		749.2 2	100	E2	307.18	6+
				908	41		148.38	4+
1059.66 17	A C F	(3+)		911.3 2			148.38	4+
				1015			44.916	2+
1060.27 14	A CDEF H	2+	0.64 ps 4	911.9 4	3.57 20	E2	148.38	4+
				1015.3 2	100.0 20	M1+E2	44.916	2+
				1060.3 2	69.8 14	E2	0.0	0+
1076.7 5	D	12+	4.4 ps 4	300.6 9	100	[E2]	775.9	10+
1105.71 7	A CD	3+		957.80 4	30 2		148.38	4+
				1060.32 2	100		44.916	2+
1128.84 7	A CD F	(2-)		68.1			1060.27	2+
				68.8			1059.66	(3+)
				130.7			997.58	3-
				178.2	36	[M1]	950.12	2-
				198.6 3	15		930.55	(1-)
				396.3 2	26.0 13		731.93	3-
				448.1 2	100 4		680.11	1-
				1084.08 7	81 4		44.916	2+
1130.75 24	A CDE H	4+		982.44 24	100		148.38	4+
1135.7 4 ?	A C			208.3 10 ?	100 29		927.21	0+
				1090.9 2 ?	71 6		44.916	2+
1150.7 4	D	9-		184			966.31	7-
				374.8 4			775.9	10+
				632.6 4			518.1	8+
1151	D	6-		123			1028	4-
				324			826.64	5-
				843			307.18	6+
1163	D	(4+)		855			307.18	6+
				1015			148.38	4+
1167.99 9	A CD GH	4+		861	13.5	E2	307.18	6+
				1018.88 3	100	E2	148.38	4+
				1123	6.8	E2	44.916	2+
1168.88 23	A CDE G	3-		41.4			1128.84	(2-)
				109.4?			1059.66	(3+)
				172	44.3	[M1]	997.58	3-

				202.6 436.9 3 489.0 10 1021 1123	16.8 100 23.4 49.6 27.0	[E1] M1+E2 E2 [E1] [E1]	966.13 731.93 680.11 148.38 44.916	2+ 3- 1- 4+ 2+
1209.3 3	C			282.2 8 1060.98 3 1209.3 3	100 43 <1014 86 14		927.21 148.38 0.0	0+ 4+ 0+
1223.78 14	A CD	2+	3.5 ps 4	258 274 293 296 1076 1179.3 3 1223.3 2	4.7 17.8 7.2 8.0 3.2 96 100	E2 E1 E1 E2 E2 M1+E2 E2	966.13 950.12 930.55 927.21 148.38 44.916 0.0	2+ 2- (1-) 0+ 4+ 2+ 0+
1232	D	5+		69 127 925 1084			1163 1105.71 307.18 148.38	(4+) 3+ 6+ 4+
1239.3 2 ?	C			932.30 7 1090.9 2 ?	≤156 100		307.18 148.38	6+ 4+
1242.9?	A			1094.5?			148.38	4+
1260.9 2 ?	C			1112.0 5 ? 1215.31 5 ?	29 3 100 6		148.38 44.916	4+ 2+
1269.2 10	CD	6+		962.0 10	100		307.18	6+
1278.54 12	A CD	2+	2.9 ps 3	546.93 10 1130.31 12 1233.65 7 1278.57 7	48 60 4 82 100 60	E1 E2 E2 E2	731.93 148.38 44.916 0.0	3- 4+ 2+ 0+
1311	CD	6+		79 149 793 1004			1232 1163 518.1 307.18	5+ (4+) 8+ 6+