Coulomb excitation **2006Be18,2005Ga22,2001Me20**

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Ameenah R. Farhan, Balraj Singh	NDS 110, 1917 (2009)	30-Jun-2009

2006Be18: ^{208}Pb(^{78}Kr,^{78}Kr′γ) E=350 and 200 MeV; ^{48}Ti(^{78}Kr,^{78}Kr′γ) E=200 and 180 MeV; ^{26}Mg(^{78}Kr,^{78}Kr′γ) E=180 MeV. Measured scattered particles in coincidence with γ rays. Position-sensitive parallel avalanche counters (PPAC) were used for particle detection. The γ rays were measured with 12 Compton-suppressed Ge detectors placed at different angles. FWHM for γ rays was 10 keV after applying correction for Doppler shift. Comparisons of measured matrix elements with predictions from "complex EXCITED VAMPIR variational" calculations. 2001Ko15 is an earlier conference paper from the same group as 2006Be18. No results were given in 2001Ko15.

GOSIA analysis used by 2006Be18 to analyze the data. Following data (from 1991 NDS for A=78, 1991Ra06) were used as starting points in this analysis: half-lives of 455, 1120, 1148, 1873, 1978, 2731, 2993, 4105 and 5217 levels and δ(693γ)=0.5 *1*. The evaluators note that more recent measurements on lifetimes are available from 2006Dh01, 2002Jo07 and 1993Bi04, as well as from the GOSIA analysis of 2006Be18.

2005Ga22: ^{197}Au(^{78}Kr,^{78}Kr′γ) E=57.4 MeV/nucleon. Measured cross section for the population of first 2^+ state, deduced B(E2) and deformation parameter. The measurement on ^{78}Kr was used as a test case for measurements on ^{72}Kr isotope.

2001Me20 (also 2004Ku11): ^{26}Mg(^{78}Kr,^{78}Kr′γ) E=220.5 MeV. Measured g factors by (θ,H,t), transient-magnetic field technique; and lifetimes by DSAM.

1981Ca01: (α,α′) E(α)=6-8 MeV.

1957He48: (α,α′) E(α)=6.1, 6.6 MeV.

2006Co03: comparison and analysis of different techniques to determine B(E2) from g.s. to first 2^+ state.

Data are from 2006Be18 unless otherwise stated. For the excitation of the first 2^+ state, B(E2) and other data are also from 2005Ga22, 2004Ku11, 2001Mo20, 1981Ca01 and 1957He48.

^{78}Kr Levels

E(level)	J^{π}[#]	$T_{1/2}$[†]	Comments
0[@]	0^+		
455[@]	2^+	21.7 ps *+7−8*	g=+0.43 *1* (2004Ku11) B(E2)=0.67 *3* (2006Be18). Others: 0.62 *7* (2005Ga22), 0.55 *3* (1981Ca01), 0.54 *13* (1957He48). See also analysis by 2006Co03. g: from transient field technique (2004Ku11), earlier value from the same group: +0.43 *3* (2001Me20). $T_{1/2}$: from B(E2)(↓)=0.134 *+5−4* (2006Be18) who used 22.8 ps *11* (from 1991Ra06) as starting point in GOSIA analysis. 2001Me20 measured 19.1 ps *17* from DSAM following Coulomb excitation. Diagonal E2 matrix element=−0.80 *4*.
1017[a]	0^+	11.1 ps *6*	$T_{1/2}$: from B(E2)(↓)=0.091 *5* (2006Be18) who used 7.6 ps *21* (from 1995Gi13) as starting point in GOSIA analysis.
1120[@]	4^+	2.42 ps *+8−17*	g=+0.46 *7* (2001Me20) g: from transient field technique (2001Me20). Diagonal E2 matrix element=−0.73 *+15−14*. $T_{1/2}$: from B(E2)(↓)=0.180 *+14−6* (2006Be18). 2006Be18 used 2.5 ps *2* (from 1991Ra06) as starting point in GOSIA analysis. 2001Me20 measured 2.09 ps *18* from DSAM following Coulomb excitation.
1148[&]	2^+	2.2 ps *+5−4*	g=+0.54 *10* (2001Me20) g: from transient field technique (2001Me20). Diagonal E2 matrix element=+0.58 *+4−8*. $T_{1/2}$: from B(E2)(↓)(1148γ)=0.005 *+1* and branching(1148γ)=0.386 *4*. 2006Be18 used 3.7 ps *4* (from 1991Ra06) as starting point in GOSIA analysis.
1756[a]	2^+		Diagonal E2 matrix element=(−0.22 *+9−14*). $T_{1/2}$: 5.3 ps *4* from B(E2)(↓)(739γ)=0.013 *1* and Branching(739γ)=0.267 *6*; but 0.074 ps *12* from B(E2)(↓)(1756γ)=0.006 *1* and Branching(1756γ)=0.131 *5*. Note large discrepancy in the two half-life values.

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Coulomb excitation 2006Be18,2005Ga22,2001Me20 (continued)

^{78}Kr Levels (continued)

E(level)	J^{π}[#]	$T_{1/2}$[†]	Comments
1873[&]	4^+	1.72 ps *+14−20*	$T_{1/2}$: from B(E2)(↓)(725γ)=0.093 *+12−7* and branching(725γ)= 0.565 *20*; 1.41 ps *+28−21* from B(E2)(↓)(1418γ)=0.0006 *1* and Branching(1418γ)=0.085 *6*. 2006Be18 used 1.4 ps *2* (from 1991Ra06) as starting point in GOSIA analysis.
1978[@]	6^+	0.61 ps *7*	Diagonal E2 matrix element=−0.87 *+16−12*. $T_{1/2}$: from B(E2)(↓)=0.20 *2*. 2006Be18 used 0.6 ps *1* (from 1995Gi13) as starting point in GOSIA analysis.
2444?[‡]	(2^+)		
2731?[‡&]	(6^+)		$T_{1/2}$: 2006Be18 used 1.5 ps *4* from 1991Ra06 as starting point in GOSIA analysis.
2993[@]	8^+	0.28 ps *3*	$T_{1/2}$: from B(E2)(↓)=0.19 *+3−2*. 2006Be18 used 0.27 ps *4* (from 1991Ra06) as starting point in GOSIA analysis.
4105[@]	10^+	0.24 ps *+2−3*	$T_{1/2}$: from B(E2)(↓)=0.14 *+2−1*. 2006Be18 used 0.24 ps *5* (from 1991Ra06) as starting point in GOSIA analysis.
5217?[‡@]	(12^+)		$T_{1/2}$: 2006Be18 used 0.17 ps *10* from 1991Ra06 as starting point in GOSIA analysis.

[†] Deduced by the evaluators from BE2 values in 2006Be18. The starting values used by 2006Be18 and taken from 1991Ra06 are listed under comments. Some values are also measured by DSAM by 2001Me20.
[‡] Level included in the analysis but not observed in the experiment (2006Be18).
[#] From 'Adopted Levels'.
[@] Band(A): g.s. band. Prolate shape ($\beta_2 \approx 0.4$) from comparison of <cos3δ> (deduced from experimental data) with model calculations.
[&] Band(B): 2^+ band. Coexistence of prolate and oblate shapes from comparison of <cos3δ> (deduced from experimental data) with model calculations.
[a] Band(C): excited 0^+ band. Mainly prolate shape from comparison of <cos3δ> (deduced from experimental data) with model calculations.

γ(^{78}Kr)

E_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α[‡]	Comments
(28)	1148	2^+	1120	4^+				B(E2)(↓)=0.020 *5*. E2 matrix element=−0.32 *+5−4*.
(131)	1148	2^+	1017	0^+				B(E2)(↓)=0.0002 *1*. E2 matrix element=−0.03 *+2−1*.
455	455	2^+	0	0^+				B(E2)(↓)=0.134 *+5−4*. E2 matrix element=+0.82 *2*.
562	1017	0^+	455	2^+				B(E2)(↓)=0.091 *5*. E2 matrix element=+0.30 *1*.
608	1756	2^+	1148	2^+				B(E2)(↓)=0.007 *+45−3*. E2 matrix element=+0.19 *+32−5*.
(636[†])	1756	2^+	1120	4^+				B(E2)(↓)=0.009 *+25−4*. E2 matrix element=+0.22 *+20−5*.
665	1120	4^+	455	2^+				B(E2)(↓)=0.180 *+14−6*. E2 matrix element=+1.27 *+5−2*.
(688[†])	2444?	(2^+)	1756	2^+				
693	1148	2^+	455	2^+	M1+E2	0.5 *1*	1.07×10^{-3} *2*	α(K)=0.000947 *19*; α(L)=0.0001013 *21*; α(M)=1.64×10^{-5} *4*; α(N+..)=1.66×10^{-6} *4* α(N)=1.66×10^{-6} *4* δ: from 'adopted gammas'.

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Coulomb excitation 2006Be18,2005Ga22,2001Me20 (continued)

$\gamma(^{78}Kr)$ (continued)

E_γ	E_i(level)	J_i^π	E_f	J_f^π	Comments
					δ(E2/M1)=+0.40 *9*, deduced (by evaluators) from E2 and M1 matrix elements of 2006Be18.
					B(E2)(↓)=0.013 *+6−4*; B(M1)(↓)=0.028 *+2−5*.
					E2 matrix element=+0.26 *+6−5*.
					M1 matrix element=+0.38 *+1−3*.
725	1873	4^+	1148	2^+	B(E2)(↓)=0.093 *+12−7*.
					E2 matrix element=+0.91 *+6−4*.
739	1756	2^+	1017	0^+	B(E2)(↓)=0.013 *1*.
					E2 matrix element=+0.26 *1*.
753	1873	4^+	1120	4^+	δ(E2/M1)=+3.2 *+23−12*, deduced (by evaluators) from E2 and M1 matrix elements of 2006Be18.
					B(E2)(↓)=0.040 *5*; B(M1)(↓)=0.002 *3*.
					E2 matrix element=−0.60 *+2−3*.
					M1 matrix element=−0.12 *+5−7*.
858	1978	6^+	1120	4^+	B(E2)(↓)=0.20 *2*.
					E2 matrix element=+1.61 *+6−8*.
(858†)	2731?	(6^+)	1873	4^+	
1015	2993	8^+	1978	6^+	B(E2)(↓)=0.19 *+3−2*.
					E2 matrix element=+1.70 *+15−8*.
1112	4105	10^+	2993	8^+	B(E2)(↓)=0.14 *+2−1*.
					E2 matrix element=+1.69 *+9−7*.
(1112†)	5217?	(12^+)	4105	10^+	
1148	1148	2^+	0	0^+	B(E2)(↓)=0.005 *1*.
					E2 matrix element=+0.157 *+3−4*.
1301	1756	2^+	455	2^+	δ(E2/M1)=−1.32 *+12−55*, deduced (by evaluators) from E2 and M1 matrix elements of 2006Be18.
					B(E2)(↓)=0.049 *+3−9*; B(M1)(↓)=0.034 *7*.
					E2 matrix element=+0.50 *+2−5*.
					M1 matrix element=−0.41 *+12−4*.
1418	1873	4^+	455	2^+	B(E2)(↓)=0.0006 *1*.
					E2 matrix element=+0.073 *+2−5*.
1756	1756	2^+	0	0^+	B(E2)(↓)=0.006 *1*.
					E2 matrix element=+0.180 *+7−8*.

† γ not seen by 2006Be18 due to small cross section and consequent low statistics, but existence of this γ is known from earlier literature.

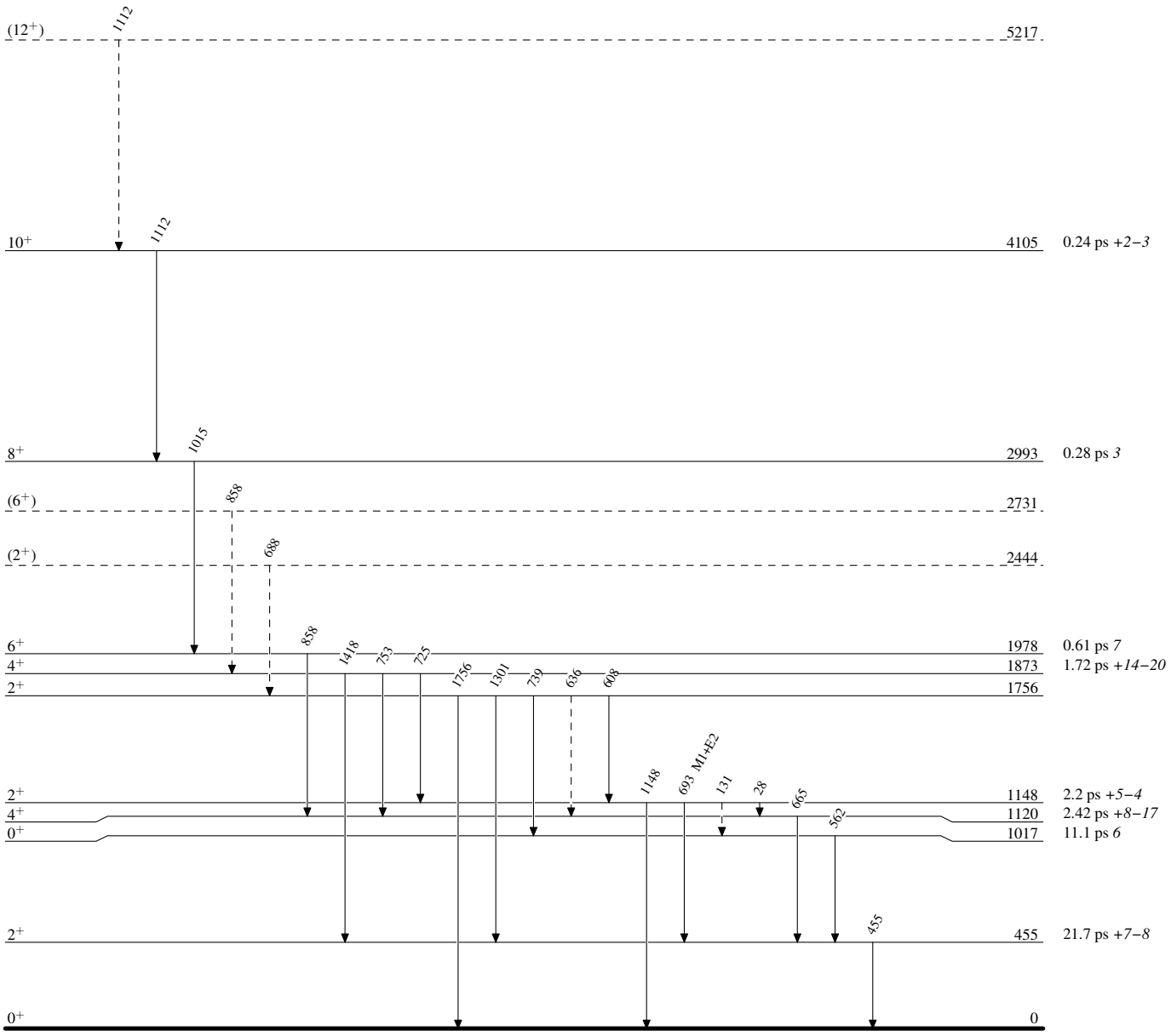
‡ Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

Legend

Coulomb excitation 2006Be18,2005Ga22,2001Me20

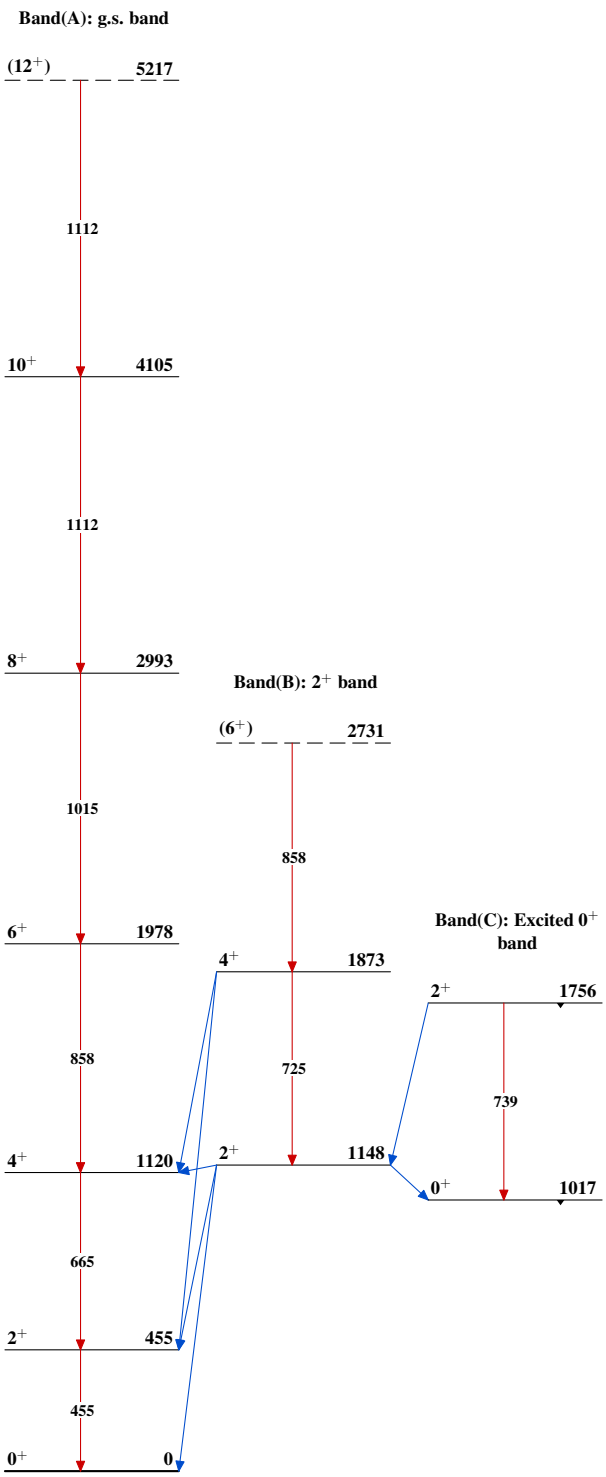
Level Scheme

γ Decay (Uncertain)



$^{78}_{36}Kr_{42}$

Coulomb excitation 2006Be18,2005Ga22,2001Me20



$^{78}_{36}Kr_{42}$