^{11}Li β^- decay:8.75 ms   2005Hi03

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, C. G. Sheu	NP A880, 88 (2012)	1-Jan-2011

Parent: ^{11}Li: E=0.0; J$^\pi$=3/2$^-$; T$_{1/2}$=8.75 ms *14*; Q(β^-)=20551.2 *11*; %β^- decay=100.0

^{11}Li-%β^- decay: From (2003Au02). Sum of β feedings to excited states in ^{11}Be from (2005Hi03) is 91% *8* which is consistent
   with 100% β-branch given by (2003Au02).

β-decay of spin-polarized ^{11}Li studied at TRIUMF-ISAC.

^{11}Li beam polarized by collinear optical pumping technique (refer to paper by Levy et al., Nucl. Instrum. Meth. B 204, 689 (2003)
   for further details).

Measured Eγ, Eβ, En, Iγ, Iβ, In, βnγ coin, $\beta(\theta)$, neutron TOF with two ΔE-E plastic scintillator telescopes, two $\approx$50% HPGe
   detectors, one ^{6}Li-doped glass scintillator and six curved, large area plastic scintillators.

1979Az03: ^{11}Li β-decay, measured β-delayed E$_N$, nn-coin. ^{11}Be levels deduced 1n, 2n decay probabilities.

1980Az01: ^{11}Li β-decay, measured β-delayed, one-, two- three-neutron emission intensity, I$_N$, relative two-, three-neutron
   branching ratios.

1980De39: ^{11}Li β-decay, measured E$_\gamma$, I$_\gamma$, I$_\beta$, β-delayed E$_N$, I$_N$. Deduced log ft total β-delayed neutron emission probability.

1981La11: ^{11}Li β-decay, measured β-delayed E$_\alpha$, β-α-coin. ^{11}Li, measured β-delayed E(^{6}He), β(^{6}He)-coin. Deduced log ft.
   ^{11}Li deduced three neutron emission probability, β-delayed I$_N$.

1991Bo31: ^{11}Li β-decay, measured continuum particle spectra following β-decay. Deduced log ft, Gamow-Teller transition
   strength, Γ-level, di-neutron, neutron halo roles.

1996Mu19: ^{11}Li(β^-), measured β-delayed deuteron-, triton-total energy spectra, β-delayed charged particles count rate vs elapsed
   time. Deduced β-delayed deuteron emission associated branching ratio lower limit.

1997Bo03: ^{11}Li(β^-), measured β-delayed D, t, ^{4,6}He, ^{9,10}Be spectra. ^{11}Be level deduced Gamow-Teller strength, branching ratios.

1997Mo35: ^{11}Li(β^-n), measured β-delayed E$_N$, I$_N$, E$_\gamma$, I$_\gamma$, T$_{1/2}$. ^{11}Be deduced levels, branching ratios, Gamow-Teller strength
   distributions, ^{11}Li neutron halo dependence.

2003Fy01: ^{11}Li(β^-n); analyzed Doppler-broadened E$_\gamma$, I$_\gamma$. ^{11}Be level deduced neutron decay T$_{1/2}$, related features.

2004Fy01: ^{11}Li(β^-), (β^-n); measured β-delayed E$_\gamma$, I$_\gamma$, $\beta\gamma$-coin, DSA. Deduced neutron spectrum.

2004Hi12: ^{11}Li(β^-), (β^-n); measured β-delayed E$_N$, E$_\gamma$, $\beta\gamma$-, βn-coin following decay of spin-polarized source; deduced log *ft*.
   ^{11}Be deduced levels, J, π, neutron spectroscopic factors.

2004Hi24: ^{11}Li(β^-), (β^-n); measured β-delayed E$_\gamma$, E$_N$, asymmetry following decay of spin-polarized source. ^{11}Be deduced
   levels, J, π.

2004Sa46: ^{11}Li(β^-), (β^-n); measured E$_\gamma$, I$_\gamma$, β-delayed neutron spectra. ^{11}Be deduced levels, J, π, halo features.

2005Hi03: ^{11}Li(β^-), (β^-n); measured β-delayed E$_\gamma$, E$_N$, asymmetry following decay of spin-polarized source. ^{11}Be deduced
   levels, J, π, S-factors.

2007RaZS: ^{11}Li(β^-); measured β-delayed deuteron, triton, charged particle total energy spectra.

2008Ma34: ^{11}Li(β^-); measured β-delayed charged-particle spectra. ^{11}Be deduced subsequent break-up decay channels.

2008MaZY: ^{11}Li(β^-); measured β-delayed E$_\alpha$, I$_\alpha$, $\alpha\alpha$-coin. ^{11}Be deduced levels, partial decay branches.

2008Ra23: ^{11}Li(β^-); measured β-delayed deuteron spectrum. Deduced transition probability.

2009Ma31: ^{11}Li(β^-); measured E$_\beta$, I$_\beta$, E$_\alpha$, I$_\alpha$, (charged-particle)(charged-particle)-coin In a kinematically complete experiments.
   Deduced B(GT). ^{11}Be deduced level energy, J, π using Monte Carlo.

^{11}Be Levels

With S(n)(^{11}Be)=501.62 keV *25* (2009AuZZ), above 320 keV, all levels listed here decay by neutron emission.

Assumption of neutron decays from 10600, 8820, 7030, and 3410 levels in ^{11}Be and 9270 level in ^{10}Be by the authors
   significantly improves the line shape fitting to the neutron TOF spectra. However, the fitting failed to reproduce the spectra around
   $\approx$70 and 85 ns, suggesting the existence of some unresolved peaks within those regions.

^{11}Li β^- decay:8.75 ms   2005Hi03 (continued)

^{11}Be Levels (continued)

E(level)[†]	J$^{\pi}$[#]	Γ	Comments
0.0	1/2$^+$[a]		
320.04[@] 10	1/2$^-$[a]	115 fs 10	
1783 4	(3/2,5/2)$^+$[a]	100 keV 10	
2654[@] 10	3/2$^-$		
3400 6	(3/2$^-$)	122 keV 8	
3889[‡@] 1	5/2$^-$	<8 keV	E(level): (2005Mi03) report E$_x$=3890 keV 1.
3955[‡&] 1	3/2$^-$[a]	10 keV 5	E(level): 3969 +20−9 quoted by (2005Hi03).
			Candidate for source level of 3.10 MeV neutron that is assigned by (2005Hi03) to 3890 level. The authors' assignment is based upon J$^{\pi}$=3/2$^-$ assignment to this level, adopted from literature. Neutron decay from this level to g.s. of ^{10}Be assumed by authors to reproduce asymmetry spectrum much better.
5255[&] 3	5/2$^-$	45 keV 10	
5849 10			
6510 50			
6705 21			
7030 50	(5/2$^-$)	0.30 MeV 10	J$^{\pi}$: From assumed neutron decay branch in (2005Hi03).
8020[‡] 20	3/2$^-$	230 keV 55	E(level): from (2005Hi03).
			E(level): Small logft value supports single α-cluster (3/2$^-$) state interpretation for this level but the small neutron spectroscopic factor favors this level as being a single α-state.
			Γ: Average of Γ=243 keV 55 and 216 keV 55 for level; widths obtained by (2005Hi03) from independent fittings of neutron peaks coincident with 219 and 2590 γ rays using neutron TOF line shape, with amplitude and level width as free parameters.
8813 25	3/2$^-$	0.20 MeV 5	E(level): Small logft value supports single α-cluster (3/2$^-$) state interpretation for this level.
10590 50	5/2$^-$	210 keV 40	
16.3×10^3 1		0.7 MeV 1	from (2009Ma31).
18.19×10^3 14		1.5 MeV 4	from (1997Bo03,2008Ra23,2009Ma31,2009Ma72).

[†] From Adopted Levels and Gammas, unless stated otherwise.
[‡] Deduced from $\beta n\gamma$ coin data in (2005Hi03).
[#] From (2005Hi03), unless otherwise stated. Assignments based upon β-decay from polarized ^{11}Be which follows the angular distribution expression given by: W(θ)≈1+APcosθ, where the asymmetry parameter A of a β-decay is −1.0, −0.4 and +0.6 for J$^{\pi}$s of 1/2$^-$, 3/2$^-$ and 5/2$^-$ of the daughter state and is derived from $\beta\gamma$, βn and $\beta n\gamma$ coin data for individual β branches. Polarization (P=0.375 10) determined from β-decay asymmetry ≈ which was measured in coin with delayed decay from 320 level using left-right asymmetry of β-counts (≈−0.294 8 observed in coin with 320γ).
[@] E, J$^{\pi}$ and log ft-value of level in good agreement with that predicted for lowest band members (K$^{\pi}$=1/2$^-$).
[&] Possible K$^{\pi}$=3/2$^-$ band member.
[a] From Adopted Levels and Gammas.

β^- radiations

Iβ normalization: From (2003Au02). Sum of β feedings to excited states in ^{11}Be from (2005Hi03) is 91% 8 which is consistent with 100% β-branch given by (2003Au02).

^{11}Li β^- decay:8.75 ms   **2005Hi03** (continued)

β^- radiations (continued)

E(decay)	E(level)	I$\beta^{-\dagger\ddagger}$	Log ft	Comments
(2.36×10^3 14)	18190	0.55 6	2.45 13	av Eβ=1015 67
(4.25×10^3 10)	16300	0.048 7	4.65 8	av Eβ=1928 49
(9.96×10^3 5)	10590	7.8 18	4.17 11	av Eβ=4749 25
				Log ft: Includes tentatively assumed neutron decays from level.
(1.174×10^4 3)	8813	8.9 14	4.45 7	av Eβ=5632 13
				Log ft: Includes tentatively assumed neutron decays from level.
(12531 20)	8020	15.5 31	4.34 9	av Eβ=6026 10
(1.352×10^4 5)	7030	0.86 17	5.76 9	av Eβ=6518 25
(15296 3)	5255	2.4 5	5.57 9	av Eβ=7401.0 16
(16596.2 15)	3955	6.8 24	5.29 16	av Eβ=8047.27
				Log ft: 5.30 +28−13 quoted by (2005Hi03).
(16662.2 15)	3889	22.7 45	4.78 9	av Eβ=8080.08
				Log ft: 4.78 +7−10 quoted by (2005Hi03).
(17151 6)	3400	0.9 2	6.24 10	av Eβ=8323.2 31
				Iβ^-: %B=0.9 4 given in Table 1 of (2005Hi03).
(17897 10)	2654	17 4	5.05 11	av Eβ=8694.0 50
(20231.2 11)	320.04	7.7 8	5.66 5	av Eβ=9853.78
				Iβ^-: β-feeding to level normalized to the average value of Iβ(320, 1/2$^-$)=7.6 8 and 7.8 8, both from literature.

† Absolute intensities determined by normalizing observed γ-decay intensity of 320 transition to average decay intensity of 7.7%
 (from literature) and assumption of isotropic β-n angular correlation and γ-ray angular distribution.
‡ Absolute intensity per 100 decays.

$\gamma(^{11}$Be)

E$_\gamma$	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Comments
320.0 5	320.04	1/2$^-$	0.0	1/2$^+$	E$_\gamma$: From (2004Sa46).

^{11}**Li** β^- **decay:8.75 ms**   **2005Hi03**

Decay Scheme

Iβ^-	Log ft			
		3/2⁻	0.0	8.75 ms *14*
		Q$_{\beta^-}$=20551.2 *11*		%β^-=100.0
		$^{11}_{3}$Li$_8$		
0.55	2.45		18190	1.5 MeV *4*
0.048	4.65		16300	0.7 MeV *1*
7.8	4.17	5/2⁻	10590	210 keV *40*
8.9	4.45	3/2⁻	8813	0.20 MeV *5*
15.5	4.34	3/2⁻	8020	230 keV *55*
0.86	5.76	(5/2⁻)	7030	0.30 MeV *10*
2.4	5.57	5/2⁻	5255	45 keV *10*
6.8	5.29	3/2⁻	3955	10 keV *5*
22.7	4.78	5/2⁻	3889	<8 keV
0.9	6.24	(3/2⁻)	3400	122 keV *8*
17	5.05	3/2⁻	2654	
7.7	5.66	1/2⁻	320.04	115 fs *10*
		1/2⁺	0.0	

320.0

$^{11}_{4}$Be$_7$