

$^{30}\text{Na}$   $\beta^-$  decay 1989Ba07,1984Gu19,2009Sc11

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia		NDS 111, 2331 (2010)	30-Jun-2010

Parent:  $^{30}\text{Na}$ :  $E=0$ ;  $J^\pi=2^+$ ;  $T_{1/2}=48$  ms 2;  $Q(\beta^-)=172.7\times 10^2$  3;  $\% \beta^-$  decay=100.0

**1989Ba07**:  $^{30}\text{Na}$  was produced bombarding a uranium carbide target with 600 MeV protons from the CERN synchrocyclotron, mass separated in the ISOLDE facility; NE213 scintillator, 2 HPGe detectors and one neutron detector; Measured:  $E\gamma$ ,  $I\gamma$ ,  $\gamma\gamma$  coin,  $\gamma$ -N coin.

**1984Gu19**:  $^{30}\text{Na}$  was produced in the fragmentation of iridium target by 10 GeV protons from the CERN synchrotron, recoiled fragments were thermalized, ionized and mass-separated; Ge(Li) detector, Measured:  $E\gamma$ ,  $\beta^- \gamma\gamma$  coin, absolute  $I\gamma$ .

**2009Sc11**:  $^{30}\text{Na}$  source was produced by bombarding a  $\text{UC}_x/\text{graphite}$  target with 1.4 GeV protons at CERN PS Booster facility; Mass separation of the reaction products was done by the ISOLDE; Measured B(ce) coin using a liquid nitrogen cooled Si(Li) detector in conjunction with a (mini-orange) magnetic transport system. The  $\gamma$ -rays following  $\beta^-$  decay were measured using a Ge detector.

 $^{30}\text{Mg}$  Levels

E(level) <sup>†</sup>	$J^\pi$ <sup>‡</sup>	Comments
0	$0^+$	
1482.53 24	$2^+$	$J^\pi$ : From Adopted Levels.
1787.9 4	$0^+$	$J^\pi$ : 1788 $\gamma$ E0 to $0^+$ g.s..
2467.8 4	$(2^+)$	$J^\pi$ : From Adopted Levels.
3303.9 5		E(level): From Adopted Levels. This level was not reported in $^{30}\text{Na}$ $\beta^-$ decay (1984Gu19).
3461.4 4	$(1 \text{ to } 3)^+$	
3541.5 4	$(1,2)^+$	
4414.9 8	$(1,2)^+$	E(level): This level and the depopulating $\gamma$ -rays are only reported by 1989Ba07.
4967.2 4	$(1,2)^+$	
5021.5 5	$(1,2)^+$	
5093.7 4	$(1,2)^+$	
5412.9 5	$(1,2)^+$	

<sup>†</sup> From a least-squares fit to the  $\gamma$ -ray energies,  $\Delta E=1$  keV assumed when not available.

<sup>‡</sup> Based on  $^{30}\text{Na}$   $\beta^-$  decay feeding from  $2^+$  g.s. (1984Gu19), except otherwise noted.

 $\beta^-$  radiations

E(decay)	E(level)	$I\beta^-$ <sup>†</sup>	Log $ft$	Comments
$(1.186\times 10^4)$ 3)	5412.9	9.5 8	5.26 5	av $E\beta=5667$ 15
$(1.218\times 10^4)$ 3)	5093.7	8.5 8	5.37 5	av $E\beta=5825$ 15
$(1.225\times 10^4)$ 3)	5021.5	7.7 6	5.42 4	av $E\beta=5861$ 15
$(1.230\times 10^4)$ 3)	4967.2	21.7 18	4.98 4	av $E\beta=5888$ 15
$(1.286\times 10^4)$ 3)	4414.9	1.80 20	6.15 6	av $E\beta=6160$ 15
$(1.373\times 10^4)$ 3)	3541.5	1.3 4	6.43 14	av $E\beta=6592$ 15
$(1.381\times 10^4)$ 3)	3461.4	3.5 6	6.01 8	av $E\beta=6631$ 15
$(1.397\times 10^4)$ 3)	3303.9	0.4 4	7.0 5	av $E\beta=6709$ 15
$(1.480\times 10^4)$ 3)	2467.8	3.8 5	6.12 6	av $E\beta=7122$ 15
$(1.579\times 10^4)$ 3)	1482.53	9.5 11	5.86 6	av $E\beta=7608$ 15

<sup>†</sup> Absolute intensity per 100 decays.

$^{30}\text{Na}$   $\beta^-$  decay [1989Ba07](#),[1984Gu19](#),[2009Sc11](#) (continued) $\gamma(^{30}\text{Mg})$ 

I $\gamma$  normalization: from  $\Sigma I(\gamma+ce)$  to (g.s.)=69 4. % $\beta^-$  n=30 4; % $\beta^-$  2n=1.15 25.

$E_\gamma$ †	$I_\gamma$ †@	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Mult.	$I_{(\gamma+ce)}$ &	Comments
305.5 3	11.6 6	1787.9	0 <sup>+</sup>	1482.53	2 <sup>+</sup>	E2		Mult.: From <a href="#">2009Sc11</a> .
985.1 ‡ 4	14.3 6	2467.8	(2 <sup>+</sup> )	1482.53	2 <sup>+</sup>			
1482.1 3	100	1482.53	2 <sup>+</sup>	0	0 <sup>+</sup>	E2		
1505.8 ‡ 4	8.3 5	4967.2	(1,2) <sup>+</sup>	3461.4	(1 to 3) <sup>+</sup>			
1552.4 ‡ 4	4.5 3	5093.7	(1,2) <sup>+</sup>	3541.5	(1,2) <sup>+</sup>			
1559.6 4	3.5 3	5021.5	(1,2) <sup>+</sup>	3461.4	(1 to 3) <sup>+</sup>			
1788		1787.9	0 <sup>+</sup>	0	0 <sup>+</sup>	E0	2.0×10 <sup>-3</sup> 4	Mult.: From <a href="#">2009Sc11</a> , a monopole strength of $\rho^2(E0)=0.026$ 8 is determined from E0(K+L) conversion intensity to the E2 $\gamma$ -ray intensity and $\gamma$ -ray lifetime measurements. $I_{(\gamma+ce)}$ : I(E0) determined by <a href="#">2009Sc11</a> from I(E0:K+L)(1789)/I $\gamma$ (306). $\rho^2(E0)=0.026$ 8 ( <a href="#">2009Sc11</a> ). Placement from Adopted Levels. 1820 $\gamma$ placement from Adopted Levels.
1788.0 ‡ 7	4.6 7	5093.7	(1,2) <sup>+</sup>	3303.9				
1820.4 5	5.6 4	3303.9		1482.53	2 <sup>+</sup>			
1870.9 9	1.3 2	5412.9	(1,2) <sup>+</sup>	3541.5	(1,2) <sup>+</sup>			
1947.0 # 8	1.6 # 3	4414.9	(1,2) <sup>+</sup>	2467.8	(2 <sup>+</sup> )			
1951.5 # 7	4.5 # 3	5412.9	(1,2) <sup>+</sup>	3461.4	(1 to 3) <sup>+</sup>			
1978.1 5	24.3 10	3461.4	(1 to 3) <sup>+</sup>	1482.53	2 <sup>+</sup>			
2059.0 # 6	2.0 # 3	3541.5	(1,2) <sup>+</sup>	1482.53	2 <sup>+</sup>			
2498.4 8	1.8 2	4967.2	(1,2) <sup>+</sup>	2467.8	(2 <sup>+</sup> )			
2626.0 # 13	2.3 # 3	5093.7	(1,2) <sup>+</sup>	2467.8	(2 <sup>+</sup> )			
3179.4 7	12.1 9	4967.2	(1,2) <sup>+</sup>	1787.9	0 <sup>+</sup>			
3484.3 7	11.6 9	4967.2	(1,2) <sup>+</sup>	1482.53	2 <sup>+</sup>			
3541.1 # 11	1.6 # 7	5021.5	(1,2) <sup>+</sup>	1482.53	2 <sup>+</sup>			
3541.6 7	6.7 6	3541.5	(1,2) <sup>+</sup>	0	0 <sup>+</sup>			
3611.0 # 14	0.8 # 1	5093.7	(1,2) <sup>+</sup>	1482.53	2 <sup>+</sup>			
3625.3 9	2.9 4	5412.9	(1,2) <sup>+</sup>	1787.9	0 <sup>+</sup>			
3930.2 9	6.6 5	5412.9	(1,2) <sup>+</sup>	1482.53	2 <sup>+</sup>			
4414.4 # 15	2.5 # 2	4414.9	(1,2) <sup>+</sup>	0	0 <sup>+</sup>			
4967.2 7	15.5 17	4967.2	(1,2) <sup>+</sup>	0	0 <sup>+</sup>			
5021.6 7	12.5 7	5021.5	(1,2) <sup>+</sup>	0	0 <sup>+</sup>			
5094.5 8	7.2 5	5093.7	(1,2) <sup>+</sup>	0	0 <sup>+</sup>			
5412.1 8	6.3 5	5412.9	(1,2) <sup>+</sup>	0	0 <sup>+</sup>			

† Weighted average of [1989Ba07](#) and [1984Gu19](#), except otherwise noted. In [1984Gu19](#) 2685.6 $\gamma$ , 3430.2 $\gamma$  and 4685.4 $\gamma$  are reported in the Table but placement of these  $\gamma$ -rays are missing. Also these  $\gamma$ -rays are not in [1989Ba07](#).

‡ From [1989Ba07](#).

# From [1989Ba07](#), not reported in [1984Gu19](#).

@ For absolute intensity per 100 decays, multiply by 0.44 3.

& Absolute intensity per 100 decays.

$^{30}\text{Na}$   $\beta^-$  decay 1989Ba07,1984Gu19,2009Sc11

## Decay Scheme

Intensities:  $I_{(\gamma+ce)}$  per 100 parent decays

Legend

- $I_{\gamma} < 2\% \times I_{\gamma}^{\max}$
- $I_{\gamma} < 10\% \times I_{\gamma}^{\max}$
- $I_{\gamma} > 10\% \times I_{\gamma}^{\max}$

