$^{23}\text{Si } \varepsilon \text{ decay}$ **1997Bl04,2018Wa05**

Parent: ^{23}Si: E=0.0; J^π=(5/2)$^+$; $T_{1/2}$=42.3 ms 4; Q(ε)=16950 SY; %ε+%β^+ decay=100.0

Other references: 1997Cz02 − same research group and same experiment of 1997Bl04.

1997Bl04,1997Cz02: Produced by $^{58}\text{Ni}(^{36}\text{Ar,x})$ E(^{36}Ar)=95 MeV/nucleon. LISE2 at GANIL. TOF mass identification, Si EΔE telescope. Measured β delayed Ep, %Ip, deduce %ε2p, level energy, etc.

2018Wa05: ^{23}Si produced from ^{28}Si beam, E=75.8 MeV/nucleon, fragmentation on ^9Be target (thickness 1980 μm). ^{23}Si was separated by Radioactive Ion Beam Line in Lanzhou, China. Particles identified by energy loss (ΔE) by two Si detectors and time of flight (TOF) by two plastic scintillators. Implanted on Si array of two double-sided Si detectors (DSSD). Also a 314−μm thick quadrant Si detector for escaping protons, another 1546 μm thick Si detector for β particle detection. Two additional Si and four clover HPGe detectors. Measured β delayed Ep, %Ip, $T_{1/2}$.

^{23}Al Levels

Proton decay branch for levels above Sp(^{23}Al)=141.0 5 (2017Wa10) assuming no competition with γ decay.

E(level)[†]	J^{π}[‡]	$T_{1/2}$	Comments
0.0	5/2$^+$	446 ms 6	$T_{1/2}$: From Adopted Levels.
1475 39	(3/2)$^+$		%p≈100 E(level): From E$_{decay}$=1333 39, weighted average of 1320 40 (1997Bl04) and 1346 39 (2018Wa05). Uncertainty − lowest input value. Level energy 1450 in 1997Bl04 and 1445 in 2018Wa05.
3166 45	(3/2)$^+$		%p≈100 E(level): From E$_{decay}$=3024 45, weighted average of 3040 60 (1997Bl04) and 3015 45 (2018Wa05). Uncertainty lowest input value. Level energy 3170 in 1997Bl04 and 3140 in 2018Wa05.
3745 45	(5/2)$^+$		%p≈100 E(level): From E$_{decay}$=3603 45: from 2356 45 [weighted average of 2400 40 (1997Bl04) and 2309 41 (2018Wa05)] + E(^{22}Mg)=1247. Also E$_{decay}$ 3650 60, level energy 3770 in 1997Bl04 and E$_{decay}$ 3524 65 and level energy 3665 in 2018Wa05.
4156 47	(7/2)$^+$		%p≈100 E(level): From E$_{decay}$=4014 47: from 2764 47 [weighted average of 2830 60 (1997Bl04) and 2730 43 (2018Wa05)] + E(^{22}Mg)=1247. Others: Level energy 4200 in 1997Bl04 and 4120 in 2018Wa05.
5134 59			%p≈100 E(level): From E$_{decay}$=4992 59: weighted ave. of 5058 51 [from 3811 51 (2018Wa05) + E(^{22}Mg)=1247] and 4939 46 [from 1631 46 (2018Wa05) + E(^{22}Mg)=3308].
11832 48	(5/2)$^+$		%2p≈100 E(level): Unweighted ave. of E$_{decay}$=11837 100 (Ep=5860 100 (1997Bl04) + S(2p)(^{23}Al) + E(^{21}Na)=332), 11834 66 (Ep=5857 66 (2018Wa05) + S(2p)(^{23}Al) + E(^{21}Na)=332), and 11825 100 (Ep=6180 100 (1997Bl04)) + S(2p)(^{23}Al). Others: 11645 64 (from Ep=6000 (2018Wa05)+S(2p)=5645). IAS level energy 11780 in 1997Bl04 and 11834 in 2018Wa05.

[†] Deduced by evaluators from E$_{decay}$ and Sp(^{23}Al)=141.0 keV 5 or S(2p)=5645.24 36 (2016AME − 2017Wa10). 1997Bl04 present level energies in Fig 5 using Sp(^{23}Al)=125 keV. Those values are listed in comments along with the Ep energies. Note that E$_{decay}$ represents the total decay energy that includes Ep and recoil energy.

[‡] From systematics of ^{23}Ne mirror states populated in ^{23}F decay. Parity determined by allowed decay to all excited states from (5/2)$^+$.

^{23}Si ε decay   **1997Bl04,2018Wa05 (continued)**

$\underline{\varepsilon,\beta^+ \text{ radiations}}$

E(decay)	E(level)	I($\varepsilon + \beta^+$)[†][‡]	Comments
(5118 *SY*)	11832	3.5 *5*	I($\varepsilon + \beta^+$): Weighted average of %I$_{2p}$=3.6 *3* [from 2.7 *2* and 1.9 *2* (1997Bl04)] and 1.5 *11* [from 0.9 *9* and 0.6 *6* (2018Wa05)].
(11816 *SY*)	5134	10.8 *6*	I($\varepsilon + \beta^+$): From %Ip=6.2 *1* and 4.6 *6* (2018Wa05).
(12794 *SY*)	4156	11.8 *22*	I($\varepsilon + \beta^+$): Unweighted average of %Ip=14 *1* (1997Bl04) and 9.6 *1* (2018Wa05).
(13205 *SY*)	3745	38 *4*	I($\varepsilon + \beta^+$): Weighted average of %Ip=39.2 *20* (from 32 *2* and 7.2 *2* − 1997Bl04) and 29 *5* (from 21 *2* and 8 *5*) (2018Wa05).
(13784 *SY*)	3166	8.5 *5*	I($\varepsilon + \beta^+$): Weighted average of %Ip=7.8 *6* (1997Bl04) and 8.9 *5* (2018Wa05).
(15475 *SY*)	1475	7.6 *25*	I($\varepsilon + \beta^+$): Unweighted average of %Ip=10 *1* (1997Bl04) and 5.1 *5* (2018Wa05).

[†] From β-delayed proton intensities in 1997Bl04 and 2018Wa05. Decay scheme incomplete.
[‡] Absolute intensity per 100 decays.

^{23}Si ε decay   **1997Bl04,2018Wa05 (continued)**