^{26}P ε decay 2004Th09,2013Be41,1983Ca06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia and A. M. Hurst	NDS 134, 1 (2016)	1-Feb-2016

Parent: ^{26}P: E=0.0; J^π=(3)$^+$; $T_{1/2}$=43.7 ms *6*; Q(ε)=18258 *90*; %ε+%β^+ decay=100.0

Also: 1984Ca29,1983Ho23,1984CaZV.

2004Th09: Fragmentation of an $^{36}Ar^{18+}$ beam on a 357.1-mg/cm^2 ^{12}C production target at the GANIL facility was used to produce the ^{26}P isotope. The LISE3 spectrometer was used for fragment separation and the ions of interest were implanted in a stacked silicon detector and identified through their time-of-flight. Measured Eγ, E(proton), Iγ, J^π, $\gamma\gamma$ coincidence, $\beta\gamma$ coincidence, pγ coincidence, p$\gamma\beta$ coincidence and $T_{1/2}$ with one segmented germanium clover and five stacked silicon detectors. Delayed $\varepsilon\alpha$ decay branch is energetically possible but no evidence was found.

2013Be41: fast ions of ^{26}P were produced at the National Superconducting Cyclotron Laboratory at the Michigan State University using a 150 MeV/nucleon, 75 pnA ^{36}Ar primary beam incident on a 1.55 g/cm^2 Be target. ^{26}P ions were separated from other fragmentation products by magnetic rigidity using the A1900 separator and by the time of flight using a radio-frequency fragment separator. ^{26}P ions were implanted into a 1-cm thick 16-strip by 16-strip planar germanium detector (GeDSSD). Implantations and subsequent beta decays were recorded in the GeDSSD and the γ rays were detected by the SeGA array of Ge detectors in two rings surrounded the GeDSSD. Measured Eβ, Eγ, Iγ, $\beta\gamma$- and $\beta\gamma\gamma$-coin. Deduced resonance energy, and resonance strength for an important state of astrophysical interest in terms of abundance of ^{26}Al in Milky Way from classical-Nova contribution.

1983Ca06 (also 1984Ca29, 1984CaZV): β^+-delayed proton decays of ^{26}P produced and identified in ^{28}Si(^{3}He,p4n) reaction using E(lab)=110-130 MeV beams of intensities 3-7 μA from the 88-Inch Cyclotron at the Lawrence Berkeley National Laboratory. β^+-delayed protons measured with 3-element silicon-detector telescope. Measured E(proton), half life, %εp, and %ε2p.

1983Ho23: β^+-delayed 2-proton emission observed from decay of ^{26}P produced using the ^{28}Si(^{3}He,p4n)^{26}P reaction by bombarding natural silicon target with 110-MeV ^{3}He beams at the 88-Inch Cyclotron at the Lawrence Berkeley National Laboratory. Recoiling atoms transported into measuring chamber via 70-cm long capillary using helium-jet system. Measured E(1-proton) and E(2-proton) spectra using ΔE(14 μm)-ΔE(170 υm)-E(500 μm) particle telescope.

^{26}Si Levels

E(level)†	J^π‡	Comments
0.0	0$^+$	T=1
1797.27 *10*	2$^+$	
2786.31 *14*	2$^+$	
3756.95 *16*	(3$^+$)	
3842.2 *15*	(4$^+$)	
4139.18 *15*	2$^+$	
4186.85 *25*	(3$^+$)	
5928.5 *8*	(3$^+$)	E(level): 2013Be41 deduced 5928.7 *6*(stat) *3*(syst) *3* (literature) by adding Eγ=1741.6 keV *6*(stat) *3*(syst) to E(level)=4187.1 *3* from 2007Se02. Other value 5929 *5* keV (2004Th09). J^π: From 2004Th09. Using S(p)(^{26}Si)=5513.8 keV *5* (2012Wa38), 2013Be41 deduced the resonance energy E_{res}=414.9 keV *6*(stat) *3*(syst) *6* (literature). Γ_γ/Γ_p=0.014 *4*(stat) *+5−4* (literature) based on the beta-delayed proton-decay branching ratio=17.96% *90* through this level (2004Th09), and total absolute γ-decay intensity Iγ=0.25% *7*(stat) *+8−7* (literature) from this level deduced from 1742γ branching=71% *+13−19* from the ^{26}Mg mirror level (2009Wr01). Further using Γ_p=2.9 eV *10* from 2009Pe04, the deduced Γ_γ=40 meV *11*(stat) *+19−18* (literature) and the resonance strength $\omega\gamma$=23 meV *6*(stat) *+11−10* (literature).
6295 *6*	2$^+$	
6384 *5*	(2$^+$)	
6765 *5*		
7501 *5*	2$^+$	
7606 *6*		
7962 *5*		
8156 *21*	(1$^-$,2$^+$)	
8254 *5*		
8563 *17*		

Continued on next page (footnotes at end of table)

^{26}P ε decay 2004Th09,2013Be41,1983Ca06 (continued)

^{26}Si Levels (continued)

E(level)†	Jπ‡	Comments
9370 *15*		
9433 *4*		
9725 *7*		
10299 *6*		
10405 *5*		
10688 *9*		
10827 *8*		
13015 *4*	(3+)	T=2 E(level): From 2004Th09. Other: 13080 keV *15* in 1983Ca06, highest T=2 level 13300 keV *1000* (stat) *600* (sys) determined in 2015Sc16 from estimated proton decay energy (c.m.) of 5100 keV *1000* (stat) *600* (sys).

† From a least-squares fitting to γ-ray energies.
‡ From Adopted Levels, except otherwise noted.

ε,β+ radiations

E(decay)	E(level)	Iβ+ ‡	Iε‡	Log *ft*	I(ε+β+)†‡	Comments
(5.24×10^3 *9*)	13015	5.3 *4*	0.0032 *3*	3.1 *1*	5.3 *4*	av Eβ=1930 *44*; εK=0.00055 *4*; εL=5.0×10^{-5} *4*; εM+=4.8×10^{-6} *4*
(7.43×10^3 *9*)	10827	0.44 *5*		5.0 *1*	0.44 *5*	av Eβ=3003 *45*
(7.57×10^3 *9*)	10688	0.24 *4*		5.4 *1*	0.24 *4*	av Eβ=3071 *45*
(7.85×10^3 *9*)	10405	0.31 *6*		5.3 *1*	0.31 *6*	av Eβ=3210 *45*
(7.96×10^3 *9*)	10299	0.67 *7*		5.0 *1*	0.67 *7*	av Eβ=3263 *45*
(8.53×10^3 *9*)	9725	0.59 *8*		5.2 *1*	0.59 *8*	av Eβ=3546 *45*
(8.83×10^3 *9*)	9433	3.5 *2*		4.5 *1*	3.5 *2*	av Eβ=3691 *45*
(8.89×10^3 *9*)	9370	0.06 *5*		6.3 *4*	0.06 *5*	av Eβ=3722 *46*
(9.70×10^3 *9*)	8563	0.27 *6*		5.9 *1*	0.27 *6*	av Eβ=4122 *46*
(1.000×10^4 *9*)	8254	0.67 *7*		5.6 *1*	0.67 *7*	av Eβ=4275 *45*
(1.010×10^4 *9*)	8156	0.11 *4*		6.4 *2*	0.11 *4*	av Eβ=4324 *46*
(1.030×10^4 *9*)	7962	0.99 *7*		5.5 *1*	0.99 *7*	av Eβ=4420 *45*
(1.065×10^4 *9*)	7606	0.65 *6*		5.7 *1*	0.65 *6*	av Eβ=4597 *45*
(1.076×10^4 *9*)	7501	2.4 *2*		5.2 *1*	2.4 *2*	av Eβ=4649 *45*
(1.149×10^4 *9*)	6765	1.5 *1*		5.5 *1*	1.5 *1*	av Eβ=5015 *45*
(1.187×10^4 *9*)	6384	1.7 *2*		5.5 *1*	1.7 *2*	av Eβ=5204 *45*
(1.196×10^4 *9*)	6295	0.78 *7*		5.9 *1*	0.78 *7*	av Eβ=5248 *45*
(1.233×10^4 *9*)	5928.5	18.0 *9*		4.6 *1*	18.0 *9*	av Eβ=5430 *45*
(1.407×10^4 *9*)	4186.85	2.91 *71*		5.7 *1*	2.91 *71*	av Eβ=6299 *45*
(1.412×10^4 *9*)	4139.18	1.78 *75*		5.9 *2*	1.78 *75*	av Eβ=6322 *45*
(1.442×10^4 *9*)	3842.2	1.68 *47*		6.0 *1*	1.68 *47*	av Eβ=6469 *45*
(1.450×10^4 *9*)	3756.95	2.68 *68*		5.8 *1*	2.68 *68*	av Eβ=6512 *45*
(1.547×10^4 *9*)	2786.31	3.3 *20*		5.9 *3*	3.3 *20*	av Eβ=6996 *45*
(1.646×10^4 *9*)	1797.27	44 *12*		4.9 *1*	44 *12*	av Eβ=7489 *45*

† Values from Tables 6 and 7 of 2004Th09 are slightly different to those of Figure 13. The total intensity adds to 95% *12*. The proton- bound levels (E<5929 keV) account for 56.4% *12* of this intensity.
‡ Absolute intensity per 100 decays.

^{26}P ε decay 2004Th09,2013Be41,1983Ca06 (continued)

γ(^{26}Si)

E_γ[†]	I_γ[#&]	E_i(level)	J_i^π	E_f	J_f^π	Comments
970.5 *1*	1.3 *5*	3756.95	(3^+)	2786.31	2^+	E_γ: 972 in 2004Th09.
988.9 *1*	5.2 *11*	2786.31	2^+	1797.27	2^+	
1400.5 *2*	2.8 *7*	4186.85	(3^+)	2786.31	2^+	E_γ: 1400.5 keV *5* in 2004Th09.
1741.6[‡] *7*	0.18[@] *6*	5928.5	(3^+)	4186.85	(3^+)	E_γ: 1741.6 *6*(stat) *3*(syst) measured by 2013Be41. Absolute Iγ(1742)=0.18% *5*(stat) *4*(lit.) based on Iγ(1796)=52% *11* from 2004Th09 and Iγ(1742)/Iγ(1796)=0.0034 *9* from the 1742- and 1796-keV peak areas.
1797.2 *1*	52 *11*	1797.27	2^+	0.0	0^+	E_γ: 1796 keV forms part of doublet structure with ^{25}Al at 1790 keV (2004Th09).
1960.1 *2*	1.3 *3*	3756.95	(3^+)	1797.27	2^+	E_γ: 1960 in 2004Th09.
2044.8	1.4 *4*	3842.2	(4^+)	1797.27	2^+	E_γ: 2046 in 2004Th09.
2341.8 *1*	1.3 *5*	4139.18	2^+	1797.27	2^+	E_γ: 2342 in 2004Th09.

[†] From Adopted Gammas, except otherwise noted.
[‡] Taken from 2013Be41.
[#] Taken from 2004Th09 except where noted.
[@] Deduced from 2013Be41.
[&] Absolute intensity per 100 decays.

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Decay Scheme

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

Legend

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