Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, Jun Chen and Ameenah R. Farhan	NDS 194,3 (2024)	8-Jan-2024

Q(β^-)=16530 *syst*; S(n)=3170 *syst*; S(p)=18250 *syst*; Q(α)=−16920 *syst* 2021Wa16

Estimated uncertainties (2021Wa16): 580 for Q(β^-), 640 for S(n), 780 for S(p) and Q(α).

S(2n)=8260 *640*, Q(β^-n)=10510 *540* (syst,2021Wa16). S(2p)=39540 (2019Mo01,theory). Q(β^-2n)=6900 *540*, Q(β^-3n)=235 *500* (syst) deduced by evaluators from mass values in 2021Wa16.

2010Oh02: ^{76}Co nuclide identified in Be(^{238}U,F) and Pb(^{238}U,F) reactions with a $^{238}U^{86+}$ beam energy of 345 MeV/nucleon produced by the cascade operation of the RBIF accelerator complex of the linear accelerator RILAC and four cyclotrons RRC, fRC, IRC and SRC. Identification of ^{76}Co nuclei was made on the basis of magnetic rigidity, time-of-flight and energy loss of the fragments using BigRIPS fragment separator. Experiments performed at RIKEN facility. Based on A/Q spectrum and Z versus A/Q plot, 5 counts were assigned to ^{76}Co isotope. (Q=charge state).

2014Xu07 (also 2014XuZZ thesis): same reaction and experimental arrangement used to produce ^{76}Co as in 2010Oh02 at RIBF-RIKEN facility. Measured heavy fragment, β and γ spectra using wide-range active silicon strip stopper array (WAS3ABi) for beta and ion detection, and EUROBALL-RIKEN Cluster array for γ detection. Decay curves were obtained from time differences between implantation and correlated β decays. See also 2014XuZZ thesis.

2015So23: ^{76}Co isomers produced in ^{9}Be(^{238}U,F), E=345 MeV/nucleon reaction with the ^{238}U beam provided by the RIBF accelerator complex at RIKEN facility. Fission fragments were separated and analyzed by BigRIPS separator, transported to focal plane of ZeroDegree spectrometer. Particle identification was achieved by ΔE-TOF-Bρ method. Silicon detector stack WAS3ABi was used for ion implantation and β detection. Gamma rays were detected using EURICA array of 12 HPGe cluster detectors arranged in three rings at 51°, 90° and 120° with respect to the beam direction. About 1000 ^{76}Co ions were implanted in the WAS3ABi Si detector stack. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\beta\gamma$(t), half-lives of isomers in ^{76}Co and ^{76}Ni. Deduced isomers, levels, J, π, configurations. Shell-model calculation with LNPS interaction for structure of ^{76}Co.

Theoretical calculations: two primary references for structure and two for decay characteristics retrieved from the NSR database (www.nndc.bnl.gov/nsr/) are listed in this dataset under 'document' records.

Additional information 1.

^{76}Co Levels

Cross Reference (XREF) Flags

A ^{76}Co IT decay (2.96 μs)

E(level)	J$^\pi$[†]	T$_{1/2}$	XREF	Comments
0.0	(1$^-$)[‡]	16 ms *4*	A	%β^-=100; %β^-n=?; %β^-2n=? Theoretical T$_{1/2}$=12.7 ms, %β^-n=18, %β^-2n=2 (2019Mo01). Theoretical T$_{1/2}$=37.6 ms, %β^-n=50.0, 70.1; %β^-2n=1.6, 3.0 (2021Mi17). E(level),J$^\pi$: ground state with (1$^-$) proposed by 2015So23 with possible configuration=$\pi f_{7/2}^{-1}\otimes\nu g_{9/2}^{-1}$. Note that in 2021Ko07 (1$^-$) is proposed as an isomer at 100 keV *100* and (8$^-$) as the g.s. 1$^-$ or 8$^-$ from Ω_p=7/2$^-$ and Ω_n=9/2$^+$ from theory (2019Mo01). T$_{1/2}$: from $\beta\gamma$(t) (2015So23), in the inset of the upper panel of Fig. 3 in 2015So23, T$_{1/2}$=16 ms is shown from β-decay time distribution gated on prompt 990γ. Other: 17.4 ms *30* (preliminary value in 2014XuZZ).
0+x	(8$^-$)[‡]	21.7 ms *+65−49*		%β^-≈100; %β^-n=?; %β^-2n=? E(level): Note that in 2021Ko07, (1$^-$) is proposed as an isomer at 100 keV *100* and (8$^-$) as the g.s. J$^\pi$: from 2015So23, based on shell-model predictions, with possible configuration=$\pi f_{7/2}^{-1}\otimes\nu g_{9/2}^{-1}$. T$_{1/2}$: from 2014Xu07, from $\beta\gamma$-coin decay curve. Other: in the inset of the middle panel of Fig. 3 in 2015So23, T$_{1/2}$=22 ms is shown from β-decay time distribution gated on delayed 355γ.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{76}Co Levels (continued)

E(level)	J^{π}[†]	$T_{1/2}$	XREF	Comments
				Measured σ=8 pb (2010Oh02), systematic uncertainty≈50%. Since no events were observed for neighboring hydrogen-like peaks, the misidentification of ^{76}Co is not likely (2010Oh02).
446.4 *7*	(2^-)[‡]		A	
638.4 *8*	(3^+)	2.96 μs *+29−25*	A	%IT≈100 $T_{1/2}$: from 192γ(t) (2015So23). E(level),J^{π}: from 2015So23, based on shell-model predictions, with possible configuration=$\pi f_{7/2}^{-1}\otimes\nu p_{1/2}^{-1}$. Other: 740 keV *100* in 2021Ko07, based on (8^-) as the g.s. and (1^-) as the g.s. This isomer decays to g.s. by 446.4γ-192.02γ cascade with a level sequence of (3^+) -> (2^-) -> (1^-).

[†] As given in Fig. 4 of 2015So23, based on shell-model calculations.
[‡] Possible member of $\pi f_{7/2}^{-1}\otimes\nu g_{9/2}^{-1}$ multiplet.

$\gamma(^{76}Co)$

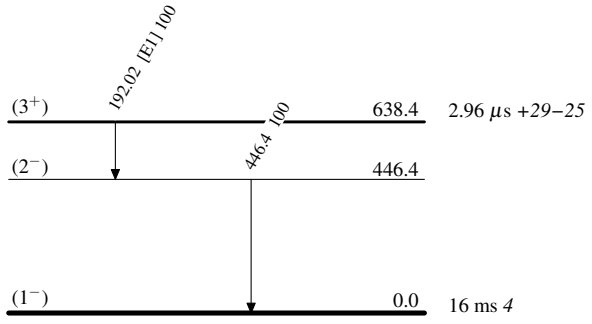
E_i(level)	J_i^{π}	E_{γ}[†]	I_{γ}	E_f	J_f^{π}	Mult.	α[‡]	Comments
446.4	(2^-)	446.4 *7*	100	0.0	(1^-)			
638.4	(3^+)	192.02 *30*	100	446.4	(2^-)	[E1]	0.0064	B(E1)(W.u.)=1.79×10^{-8} *16* In deducing B(E1)(W.u.), 100% branch is assumed for 192γ. Mult.: proposed by 2015So23 as E1 based on comparison of the measured half-life with expected half-lives for different mutipolarities of 192 and 446 γ rays: M1, E2, E3 for intraband transitions with assumed 1 W.u. transition probability; E1, M2, E3 for interband transitions with theoretical transition probabilities from shell-model calculations.

[†] From ^{76}Co IT decay (2015So23).
[‡] 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.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{76}_{27}Co_{49}$