^{207}Pb(^{18}O,2α2nγ) 2012De11

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation		NDS 114, 2023 (2013)	23-Sep-2013

Includes population of a high-spin isomer through fragmentation of ^{238}U beam at 1 GeV/nucleon (2012BoZU,2013Bo18).

2012De11: E(^{18}O)=93 MeV from INFN, Legnaro facility. Measured Eγ, Iγ, $\gamma\gamma$-, $\alpha\gamma$-, (x ray)γ-coin, $\gamma(\theta)$ using GASP-ISIS spectrometer. Target=2 mg/cm^2 thick backed by a 25 μg/cm^2 carbon foil. Gamma rays were detected by GASP array of 40 Compton-suppressed Ge detectors and multiplicity filter of 80 BGO detectors. The alpha particles from reaction channel were detected by ISIS telescopic array of 40 ΔE-E Si detectors. A total of 350,000 $\gamma\gamma\alpha$ coincidence events were recorded, about 33% of which belonged to 2α2n channel leading to levels in ^{215}Rn, others to 2α1n channel leading to levels in ^{216}Rn. Deduced high-spin levels, J, π in ^{215}Rn.

2013Bo18, 2012BoZU: ^{9}Be(^{238}U,X), E=1 GeV/nucleon; measured Eγ, Iγ, half-life of a high-spin isomer by γ(t) method.

^{215}Rn Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	Comments
0.0[#]	9/2$^+$		
316.5[@] *2*	11/2$^+$		
570.1[#] *2*	13/2$^+$		
946.3[@] *2*	15/2$^+$		
1016.5[#] *2*	17/2$^+$		
1334.3[@] *2*	19/2$^+$		
1403.8[#] *3*	21/2$^+$		
1607.8[@] *3*	23/2$^+$		
1731.1[#] *3*	(25/2)$^+$		
1804.8[@] *4*	27/2$^+$		
1804.8+x		57 ns *+21−12*	%IT=100 $T_{1/2}$: from γ(t) in ^{9}Be(^{238}U,X), E=1 GeV/nucleon reaction (2013Bo18,2012BoZU). E(level): may correspond to 1804.8, 27/2$^+$ level, but from available data in 2013Bo18 and 2012BoZU location of the isomer remains uncertain. Three γ rays of 287, 392 and 656 keV of similar intensities are reported in 2012BoZU, which may be related to the decay of this isomer.
2287.1[@] *4* y	(29/2$^+$)		Additional information 1.
383.5+y *2*			
542.2+y *3*			

[†] From least-squares fit to Eγ data.

[‡] As assigned by 2012De11 based on multipolarity assignments, band structures, and systematics of similar bands in ^{213}Rn, ^{217}Rn and ^{219}Th. In Adopted Levels, most of these assignments are given in parentheses since strong arguments are lacking.

[#] Band(A): Band built on $\nu g^3_{9/2}$.

[@] Band(B): Band built on $\nu g^2_{9/2}\otimes\nu i_{11/2}$.

γ(^{215}Rn)

R(θ)=angular anisotropy ratio for a set of detectors at 31.7°, 36.0°, 144.0° and 148.3° and the other set at 90° relative to the incident beam direction. Expected ratio is 1 for ΔJ=2, quadrupole (or stretched quadrupole) and 0.57 for ΔJ=1, dipole (or stretched dipole). No gating transitions were used for these measurements.

Continued on next page (footnotes at end of table)

^{207}Pb(^{18}O,2α2nγ) 2012De11 (continued)

γ(^{215}Rn) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[&]	Comments
123.2 *2*	5 *1*	1731.1	(25/2)$^+$	1607.8	23/2$^+$	(M1)	7.24	Mult.: from γ-ray total intensity balance (2012De11).
158.7 *2*	22 *6*	542.2+y		383.5+y				R(θ)=1.1 *5*.
197.0 *2*	9 *2*	1804.8	27/2$^+$	1607.8	23/2$^+$	(E2)	0.552	R(θ)=0.90 *26*.
203.9 *2*	27 *6*	1607.8	23/2$^+$	1403.8	21/2$^+$	(M1)	1.743	R(θ)=0.5 *2*.
x215.6[‡] *2*	4.3 *9*							
x230.9[‡] *2*	4.1 *9*							
273.6 *2*	24 *5*	1607.8	23/2$^+$	1334.3	19/2$^+$	(E2)	0.183	R(θ)=0.92 *25*.
x287[@]								
316.4 *2*	25 *3*	316.5	11/2$^+$	0.0	9/2$^+$	M1	0.516	R(θ)=0.7 *2*.
317.7[#] *2*	10[#] *2*	1334.3	19/2$^+$	1016.5	17/2$^+$	(M1+E2)	0.31 *20*	Mult.: I(γ+ce)=15 *5* and Iγ=10 *2* listed in 2012De11 suggest M1. α: value overlaps M1 or E2.
327.4 *2*	10 *2*	1731.1	(25/2)$^+$	1403.8	21/2$^+$	[E2]	0.1067	
376.4 *2*	<2	946.3	15/2$^+$	570.1	13/2$^+$			
383.5 *2*	42 *8*	383.5+y		y				Eγ: from table I of 2012De11. Eγ=383.3 in authors' level-scheme figure 2. Mult.: (E2) deduced by evaluators from I(γ+ce)=45 *9* and Iγ=42 *8* listed in 2012De11, but asymmetry ratio suggests dipole. R(θ)=0.6 *2*.
387.2 *2*	78 *14*	1403.8	21/2$^+$	1016.5	17/2$^+$	(E2)	0.0670	R(θ)=0.9 *2*.
388.1[#] *2*	25[#] *7*	1334.3	19/2$^+$	946.3	15/2$^+$	[E2]	0.0665	Mult.: (E2) in 2012De11.
x392[@]								
446.2 *2*	86 *6*	1016.5	17/2$^+$	570.1	13/2$^+$	(E2)	0.0464	R(θ)=0.85 *15*.
482.3 *2*	13 *1*	2287.1	(29/2$^+$)	1804.8	27/2$^+$	[M1+E2]	0.10 *7*	α: value overlaps M1 or E2.
570.2 *2*	100 *5*	570.1	13/2$^+$	0.0	9/2$^+$	(E2)	0.0259	R(θ)=1.00 *15*.
x572.5[‡] *2*	5 *2*							
629.8 *2*	26 *3*	946.3	15/2$^+$	316.5	11/2$^+$	(E2)	0.0208	R(θ)=0.9 *3*.
x656[@]								

[†] Dipole or quadrupole from angular anisotropy ratios; electric or magnetic character from total intensity balance.
[‡] This γ ray belongs to ^{215}Rn but is not included in the present level scheme.
[#] Contaminated line. Intensity deduced from coincidence spectra.
[@] The γ ray reported by 2012BoZU in ^{9}Be(^{238}U,X), E=1 GeV/nucleon reaction, and in coincidence with known transitions in ^{215}Rn from the work of 2012De11, but not placed in level scheme. 2012BoZU state that intensities of 287, 392 and 656 γ rays are similar.
[&] 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.
[x] γ ray not placed in level scheme.

^{207}Pb(^{18}O,2α2nγ) 2012De11

Level Scheme

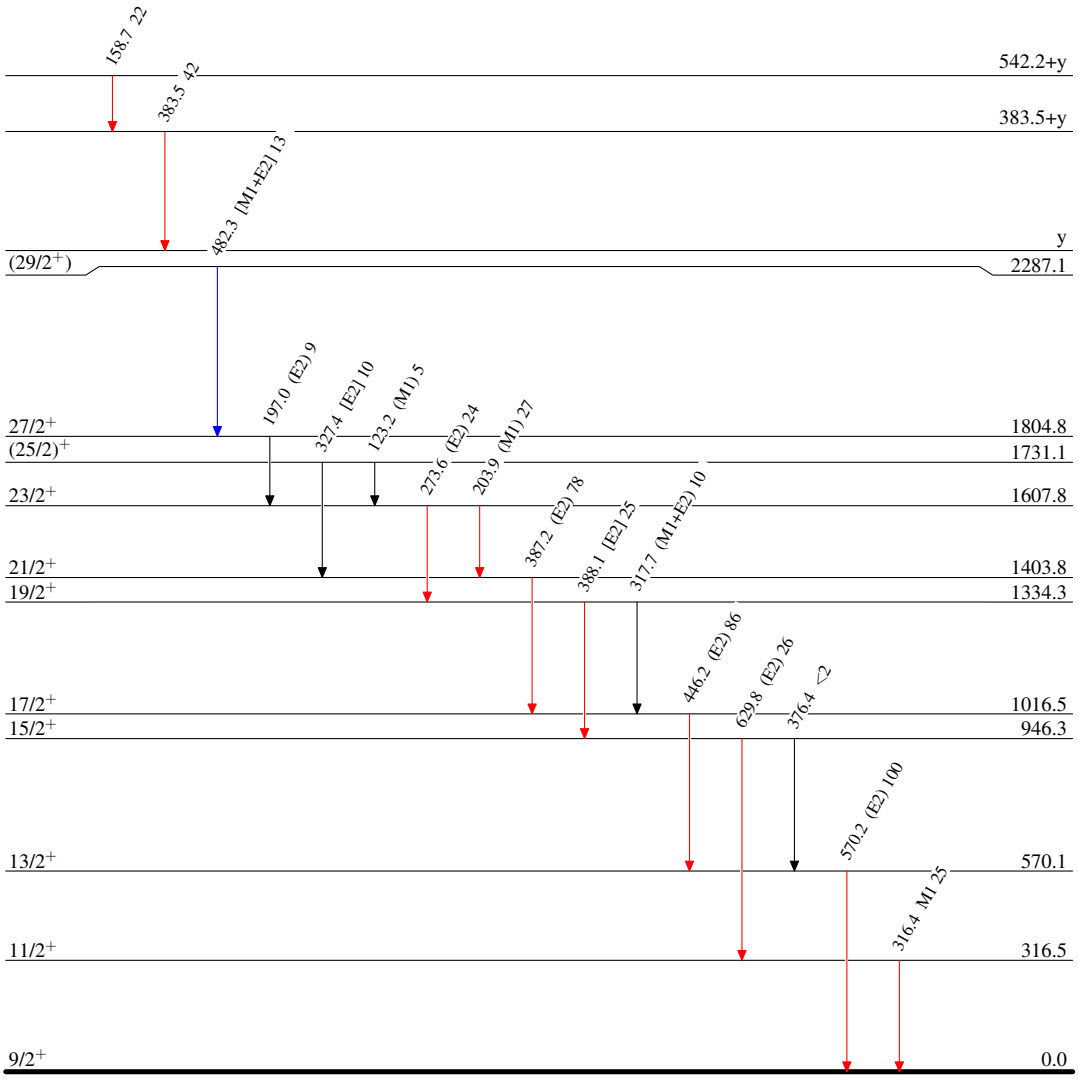
Intensities: Relative I_γ

Legend

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

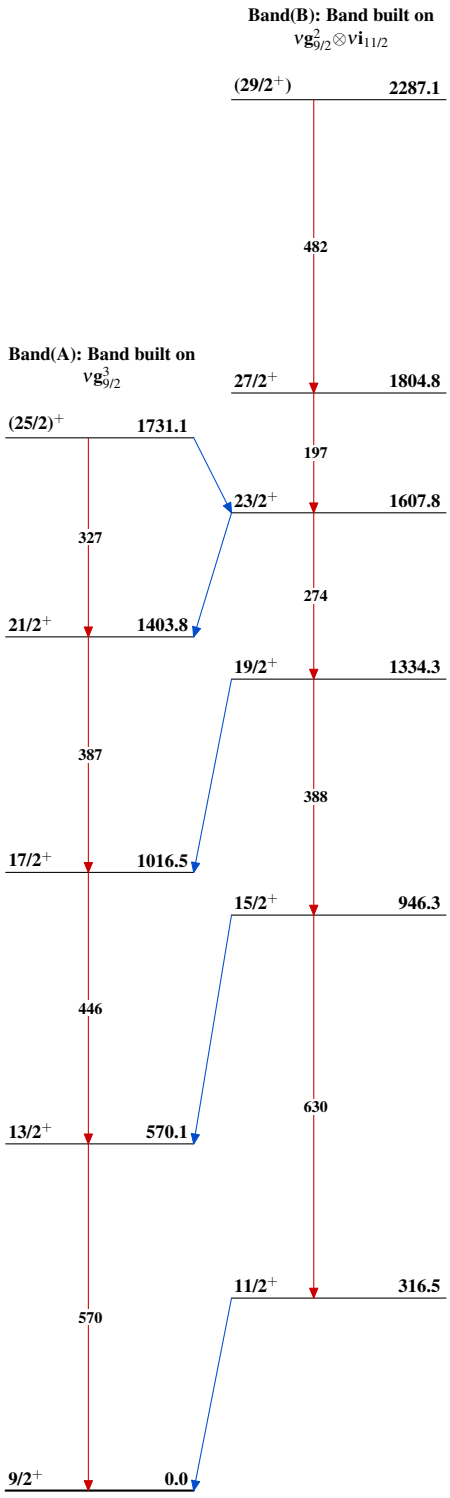
$I_\gamma < 10\% \times I_\gamma^{max}$

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



$^{215}_{86}Rn_{129}$

^{207}Pb(^{18}O,2α2nγ) 2012De11



$^{215}_{86}Rn_{129}$