

¹⁴¹Nd ε decay (62.0 s) 1988Ch39,1970Ab05

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 187,1 (2023)	12-Oct-2022

Parent: ¹⁴¹Nd: E=756.51 5; J^π=11/2⁻; T_{1/2}=62.0 s 8; Q(ε)=1823.0 28; %ε+%β⁺ decay=0.025 25

¹⁴¹Nd-Q(ε): From 2021Wa16.

¹⁴¹Nd-%ε+%β⁺ decay: according to 1988Ch39 the sum of the three estimated branches from the ¹⁴¹Nd ε decay (62.0 s) is less than 0.05% (see β⁺,ε Data table below).

Measured: γ (1988Ch39,1970Ab05).

1970Ab05: studied the branching of the 62.0 s, 11/2⁻, 757 keV isomer in ¹⁴¹Nd in between the ε and IT decays; observed both the 972γ following ¹⁴¹Nd ε decay (62.0 s) from the daughter level 11/2⁻, 1118 in ¹⁴¹Pr, and the 757γ from ¹⁴¹Nd IT decay (62.0 s) decay, and determined that I(γ+ce)(972γ)/I(γ+ce)(757γ)=0.00032 8.

1988Ch39: Re-studied the isomer branching; did not observe the 972γ (which presumably was below their detection limit) but only determined the limit I(γ+ce)(972γ)/I(γ+ce)(757γ)<0.00009. Used the (α,2nγ) reaction to measure the branching of γ rays depopulating the 11/2⁻, 1118 level and used the γ-ray branchings from the (n,n'γ) reaction (1984Tr02) for the 9/2⁻, 2001 and 2383 levels to determine ε feeding limits for these three levels (the most likely to be populated by the ε decay of the isomer).

The level scheme is from 1988Ch39 and is incomplete showing only the levels and γ rays they included in the ε decay of the 62.0 s isomer. According to 1970Ab05 the identification of 972γ in the insert of Fig. 1 "Gamma-ray spectrum from the decay of ^{141m}Nd" justifies the ε direct population of the 1118 level in ¹⁴¹Pr even though this was not confirmed by 1988Ch39 (presumably because of lack of sensitivity of their experiment, as suggested by a weaker 757γ relative to 1970Ab05). The 972γ populates the 145 level decayed by the 145γ to ¹⁴¹Pr g.s., and also implies the direct decay to the g.s. by the weaker 1118γ branch. For the other two levels considered by 1988Ch39, 2001 and 2383, only weak limits were established and the existence of the respective ε decay branches is questionable. No other γ decays of these levels other than suggested by 1988Ch39 were considered by the evaluator (see the Adopted Levels, Gammas dataset for other possible transitions).

¹⁴¹Pr Levels

E(level)	J ^π †	T _{1/2} †	Comments
0.0	5/2 ⁺	stable	
145.44	7/2 ⁺	1.85 ns 3	
1117.60	11/2 ⁻	4.8 ns 1	
1452.2?	(7/2) ⁺	0.31 ps +11-7	
1521.0?	9/2 ⁺	150 fs +19-16	
2000.8?	(9/2) ⁻	0.22 ps +12-6	
2382.8?	(9/2 ⁻ ,11/2 ⁻)	0.24 ps +28-9	J ^π : 11/2 ⁻ in 1988Ch39.

† Adopted values.

ε,β⁺ radiations

E(decay)	E(level)	Iβ ⁺ ‡	Iε ‡‡	Log ft†	I(ε+β ⁺) ‡‡	Comments
(196.7# 28)	2382.8?		<0.012	>4.9	<0.012	εK=0.7888 12; εL=0.1627 9; εM+=0.0485 3
(578.7# 28)	2000.8?		<0.020	>5.7	<0.020	εK=0.8332 1; εL=0.12952 7; εM+=0.03724 3
(1461.9 28)	1117.60	<2.76×10 ⁻⁵	<0.01000	>6.9	<0.01003	av Eβ=208.8 13; εK=0.8418; εL=0.12103 2; εM+=0.034415 6

† Estimated by 1988Ch39.

‡ Absolute intensity per 100 decays.

Existence of this branch is questionable.

^{141}Nd ε decay (62.0 s) **1988Ch39,1970Ab05** (continued)

$\gamma(^{141}\text{Pr})$							
$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\ddagger	E_f	J_f^π	Mult.#	$\delta^\#$
145.44	7/2 ⁺	145.44 [@]	5	0.0	5/2 ⁺	M1+E2	+0.069 7
1117.60	11/2 ⁻	972.14 ^{&}	10	145.44	7/2 ⁺	M2(+E3)	+0.17 +9-8
		1117.60 ^{&}	10	0.0	5/2 ⁺	E3	
2000.8?	(9/2) ⁻	548.8 ^{ab}	21 ^a	1452.2?	(7/2) ⁺	(E1)	
		883.1 ^{ab}	51 ^a	1117.60	11/2 ⁻		
		1855.4 ^{ab}	100 ^a	145.44	7/2 ⁺	(E1)	
2382.8?	(9/2 ⁻ ,11/2 ⁻)	861.8 ^{ab}	100 ^a	1521.0?	9/2 ⁺	(E1)	
		1265.3 ^{ab}	35 ^a	1117.60	11/2 ⁻	(E2+M1)	

[†] Neither of the γ rays was observed in the ^{141}Nd ε decay (62.0 s); (the initial observance by [1970Ab05](#) of 972 γ was not confirmed by [1988Ch39](#)).

[‡] Relative photon branching from each level.

[#] Adopted values.

[@] From [1988Ch39](#) in ($\alpha,2n\gamma$) reaction and also observed in ^{141}Nd ε g.s. decay (2.49 h).

[&] Measured by [1988Ch39](#) in ($\alpha,2n\gamma$) reaction.

^a Quoted by [1988Ch39](#) from (n,n' γ) reaction ([1984Tr02](#)).

^b Placement of transition in the level scheme is uncertain.

^{141}Nd ϵ decay (62.0 s) 1988Ch39,1970Ab05

Decay Scheme

Legend

Intensities: Relative photon branching from each level

----- \rightarrow γ Decay (Uncertain)

