

**Adopted Levels, Gammas**

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh		NDS 190,1 (2023)	20-Jun-2023

Q( $\beta^-$ )=12190 90; S(n)=4.39×10<sup>3</sup> 11; S(p)=15570 90; Q( $\alpha$ )=-1476×10<sup>1</sup> 12 [2021Wa16](#)

S(2n)=11790.0 1000, S(2p)=36150 130, Q( $\beta^-$ n)=3460 90 ([2021Wa16](#)).

<sup>44</sup>Cl identified in <sup>64</sup>Ni(<sup>48</sup>Ca,X) E=60 MeV/nucleon ([1995So03](#)). Particle stability established in <sup>9</sup>Be(<sup>48</sup>Ca,X) reaction ([1979We10](#)).

Other measurements:

[1999WiZX](#): <sup>44</sup>Cl produced by fragmentation of <sup>48</sup>Ca beam at 70 MeV/nucleon with a Be target. Measured E $\gamma$ , I $\gamma$ ,  $\gamma\gamma$  coin and  $\beta\gamma\gamma$  coin using Ge and Si detectors.

[1999Ai02](#): <sup>44</sup>Cl beam from <sup>55</sup>Mn fragmentation, Si(<sup>44</sup>Cl,X) studied. Measured cross section and strong absorption radius. A1200 separator at NSCL facility.

[2006Kh08](#): <sup>44</sup>Cl beam from <sup>48</sup>Ca fragmentation at 60.3 MeV/nucleon with <sup>181</sup>Ta target using LISE3 at GANIL facility, Si(<sup>44</sup>Cl,X) studied. Measured cross section and strong absorption radius.

[2010De11](#): measurement of g factor of <sup>44</sup>Cl g.s. by  $\beta$ -NMR method. <sup>44</sup>Cl produced in fragmentation of <sup>48</sup>Ca beam at 60 MeV/nucleon bombarding <sup>9</sup>Be target. Secondary beam selected by LISE separator at GANIL facility. Large scale shell-model calculations.

Mass measurements: [2018Mi08](#), [2000Sa21](#) (also [2001Sa72](#)), [1991Zh24](#), [1990Tu01](#).

No information is available for population of levels in <sup>44</sup>Cl from  $\beta^-$  decay of <sup>44</sup>S.

The delayed-neutron decay of <sup>45</sup>S is reported as 54% ([1995So03](#)) which is expected to populate <sup>44</sup>Cl, but no level or feeding data are available.

[2010Ga15](#): theory: calculated levels,  $J^\pi$  using shell model.

Theoretical calculations: in addition to one structure reference listed above, four other references for structure and one for radioactive decays retrieved from the NSR database ([www.nndc.bnl.gov/nsr/](http://www.nndc.bnl.gov/nsr/)) are listed in document records which can be accessed via web-based ENSDF database.

[Additional information 1](#).

<sup>44</sup>Cl Levels

Cross Reference (XREF) Flags

- A <sup>44</sup>S  $\beta^-$  decay (117 ms)
- B <sup>9</sup>Be(<sup>45</sup>Cl,<sup>44</sup>Cl $\gamma$ )
- C <sup>9</sup>Be(<sup>48</sup>K,X $\gamma$ )

E(level) <sup>†</sup>	J <sup><math>\pi</math></sup>	T <sub>1/2</sub>	XREF	Comments
0	(2 <sup>-</sup> )	0.54 s 11	ABC	$\% \beta^- = 100$ ; $\% \beta^- n < 8$ ( <a href="#">1995So03</a> ) $\mu = (-)0.5498$ 4 ( <a href="#">2010De11</a> , <a href="#">2019StZV</a> ) $\mu$ : from g factor= $(-)0.2749$ 2 measured using $\beta$ -NMR method ( <a href="#">2010De11</a> ). Sign is from theoretical model calculations. <a href="#">Additional information 2</a> . $J^\pi$ : L=1 in <sup>9</sup> Be( <sup>45</sup> Cl, <sup>44</sup> Cl) implies knockout of a neutron from 1p <sub>3/2</sub> orbit. Measured g factor ( <a href="#">2010De11</a> ) and comparisons with shell-model calculations supports 2 <sup>-</sup> assignment with highly mixed configuration containing main components: $\pi d_{3/2}^3 \otimes \nu f_{7/2}^1$ and $\pi s_{1/2}^1 \otimes \nu p_{3/2}^1$ . T <sub>1/2</sub> : unweighted average of 650 ms 50 ( <a href="#">1999WiZX</a> ) and 434 ms 60 ( <a href="#">1995So03</a> ). Cross sections in Si( <sup>44</sup> Cl,X): 2.92 b 21 at 51.62 MeV/nucleon, 2.63 b 7 at 44.98 MeV/nucleon. Strong absorption radius $r_0^2 = 1.21$ fm <sup>2</sup> 3 at 44.98 MeV/nucleon ( <a href="#">2006Kh08</a> ). Other: 1.33 fm <sup>2</sup> 13 at 65.47 MeV/nucleon ( <a href="#">1999Ai02</a> ). $J^\pi$ : shell-model calculations predict 4 <sup>-</sup> isomer at 620 keV de-exciting by an E2 transition to a g.s. and M1 transition to a 515 level. T <sub>1/2</sub> : measured by <a href="#">2009Ri04</a> from line-shape method in ( <sup>45</sup> Cl, <sup>44</sup> Cl $\gamma$ ).
475 6	(4 <sup>-</sup> )	1.0 ns +35-7	BC	$J^\pi$ : shell-model calculations predict 4 <sup>-</sup> isomer at 620 keV de-exciting by an E2 transition to a g.s. and M1 transition to a 515 level.
518 4			C	T <sub>1/2</sub> : measured by <a href="#">2009Ri04</a> from line-shape method in ( <sup>45</sup> Cl, <sup>44</sup> Cl $\gamma$ ).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ${}^{44}\text{Cl}$  Levels (continued)

<u>E(level)<sup>†</sup></u>	<u>J<sup>π</sup></u>	<u>XREF</u>	<u>Comments</u>
725 4		C	
891? 5		A C	
996? 5		A C	
2789 1	(1 <sup>+</sup> )	A	J <sup>π</sup> : possible Gamow-Teller β transition from 0 <sup>+</sup> parent ( <a href="#">2022Tr03</a> ).

<sup>†</sup> From E<sub>γ</sub> data.

γ( ${}^{44}\text{Cl}$ )

Two strong γ rays at 515 and 720 keV are reported by [2009Ri04](#) in the  ${}^9\text{Be}({}^{45}\text{Cl}, {}^{44}\text{Cl})\gamma$  reaction, but not placed in the level scheme.

<u>E<sub>i</sub>(level)</u>	<u>J<sub>i</sub><sup>π</sup></u>	<u>E<sub>γ</sub><sup>†</sup></u>	<u>I<sub>γ</sub></u>	<u>E<sub>f</sub></u>	<u>J<sub>f</sub><sup>π</sup></u>	<u>Mult.</u>	<u>Comments</u>
475	(4 <sup>-</sup> )	475 6	100	0	(2 <sup>-</sup> )	[E2]	B(E2)(W.u.)=2.5 +56-16
518		518 4	100	0	(2 <sup>-</sup> )		
725		725 4	100	0	(2 <sup>-</sup> )		
891?		891 5	100	0	(2 <sup>-</sup> )		
996?		996 5	100	0	(2 <sup>-</sup> )		
2789	(1 <sup>+</sup> )	2789 1	100	0	(2 <sup>-</sup> )		

<sup>†</sup> From [2012St12](#) in ( ${}^{48}\text{K}, X\gamma$ ).

**Adopted Levels, Gammas**Level Scheme

Intensities: Relative photon branching from each level

