

**Adopted Levels, Gammas**

| Type            | Author                   | History | Citation            | Literature Cutoff Date |
|-----------------|--------------------------|---------|---------------------|------------------------|
| Full Evaluation | Ninel Nica, Balraj Singh |         | NDS 113,1563 (2012) | 28-May-2012            |

Q( $\beta^-$ )=4592 15; S(n)=7514 15; S(p)=1.878×10<sup>4</sup> 8; Q( $\alpha$ )=-13498 15 [2012Wa38](#)  
 Note: Current evaluation has used the following Q record 4592 14 7514 14 18809 70-13490 19 [2011AuZZ](#).  
 S(2n)=12022 14, S(2p)=33623 23 ([2011AuZZ](#)).  
 Values in [2003Au03](#): Q( $\beta^-$ )=4601 15, S(n)=7535 21, S(p)=18720 70, Q( $\alpha$ )=-13471 16, S(2n)=12018 14, S(2p)=33580 23.  
 Identifications and production of <sup>34</sup>Si: [1971Ar32](#) in <sup>232</sup>Th(<sup>40</sup>Ar,X) at E=290 MeV. Later study: [1977Na05](#).  
[2008Wi09](#): <sup>208</sup>Pb(<sup>36</sup>S,X) E=230 MeV. Measured E $\gamma$  using GAMMASPHERE array and CHICO arrays at ANL. The known  $\gamma$  rays of 125, 591, 930, 3326 and 4255 keV were observed in this work. Main study was for <sup>35</sup>P structure.  
 Measurement of strong absorption radius: [2006Kh08](#), [1999Ai02](#).  
**Additional information 1.**  
 Structure calculations: [2009Bo16](#) (negative-parity intruders, shell model); [2009Gr04](#) (binding energy, charge radius, neutron density, shell model); [2007Co22](#) (binding energy, single proton transfer reactions); [2002St30](#) (shell closure effects); [2002Ut02](#) (levels, spins, shell model); [2001Ca49](#) (levels, spins, B(E2), shell model); [2000Pe27](#) (shell closure features); [2000Ro08](#) (2<sup>+</sup> levels, B(E2)); [1994Po05](#) (intruder levels);  
[1999Ai02](#): measurement of strong absorption radius; Si(<sup>34</sup>P,X) reaction at 38-80 MeV/nucleon, NSCL facility. The <sup>34</sup>P beam was obtained from fragmentation of <sup>55</sup>Mn beam with <sup>9</sup>Be target at 50-90 MeV/nucleon.  
[1986Sm05](#), [1985Wo07](#): <sup>64</sup>Ni(<sup>36</sup>S,<sup>34</sup>Si) E=198 MeV. Measured  $\sigma$ , deduced mass excess.  
 Nuclear structure theoretical calculations:  
[1992Fu07](#): *pf*-shell occupation numbers, vanishing of N=20 shell gap.  
[1991He06](#): intruder states.  
[1988Wa04](#): levels, decay scheme parameters, shell model.

<sup>34</sup>Si Levels

A 2133, (0<sup>+</sup>) level proposed in [2001Nu01](#) but not confirmed by [2002Mi44](#) and [2003Iw02](#) is omitted here. The 1193 transition feeding from 3326 level to a 2133 level is placed from a 4519 level to 3326 level according to [2003Iw02](#).

Cross Reference (XREF) Flags

|          |  |          |   |          |   |
|----------|--|----------|---|----------|---|
| <b>A</b> | <sup>34</sup> Al $\beta^-$ decay (56.3 ms)                     | <b>E</b> | <sup>9</sup> Be( <sup>35</sup> Si, <sup>34</sup> SiX $\gamma$ ) | <b>I</b> | <sup>160</sup> Gd( <sup>36</sup> S,X $\gamma$ ) |
| <b>B</b> | <sup>35</sup> Al $\beta^-$ -n decay (37.7 ms)                  | <b>F</b> | Si( <sup>34</sup> Si, <sup>34</sup> Si' $\gamma$ )              | <b>J</b> | Coulomb excitation                              |
| <b>C</b> | <sup>2</sup> H( <sup>34</sup> Si, <sup>34</sup> Si' $\gamma$ ) | <b>G</b> | <sup>36</sup> S( <sup>11</sup> B, <sup>13</sup> N)              |          |   |
| <b>D</b> | <sup>7</sup> Li( <sup>34</sup> P, <sup>7</sup> Be $\gamma$ )   | <b>H</b> | <sup>36</sup> S( <sup>14</sup> C, <sup>16</sup> O)              |          |   |

| E(level)            | J $^\pi$          | T <sub>1/2</sub> | XREF   | Comments   |
|---------------------|-------------------|------------------|--|--|
| 0.0                 | 0 <sup>+</sup>    | 2.77 s 20        | <a href="#">ABCDEFGHIJ</a>                                 | % $\beta^-$ =100<br>Measured $r_0^2=1.23$ fm <sup>2</sup> 4 ( <a href="#">2006Kh08</a> ) in Si( <sup>34</sup> Si,X) reaction at 51.5 MeV/nucleon and 58.9 MeV/nucleon. Integral cross sections were also measured.<br>$r_0^2$ (strong absorption)=1.20 fm <sup>2</sup> 8 ( <a href="#">1999Ai02</a> ).<br>T <sub>1/2</sub> : from <a href="#">1977Na05</a> . |
| 3327.14 20          | 2 <sup>+</sup>    | 82 fs 32         | <a href="#">ABCDEF</a> <a href="#">IJ</a>                  | J $^\pi$ : level excited in Coulomb excitation, inelastic scattering, systematics, and shell-model predictions.<br>T <sub>1/2</sub> : from B(E2)=0.0085 33 in Coul. ex. ( <a href="#">1998Ib01</a> ).  |
| 3590 25<br>4256.1 4 | (3 <sup>-</sup> ) | <210 ns          | <a href="#">ABCDEF</a> <a href="#">H</a> <a href="#">I</a> | J $^\pi$ : level excited in inelastic scattering, possible allowed $\beta$ decay from (4 <sup>-</sup> ), systematics, and shell-model predictions.<br>T <sub>1/2</sub> : estimated from $\beta\gamma$ (t) ( <a href="#">1989Ba50</a> ) in <sup>34</sup> Al $\beta^-$ decay.  |
| 4380.2 4            | (3 <sup>-</sup> ) |                  | <a href="#">ABCDE</a> <a href="#">I</a>                    | XREF: E(?).<br>J $^\pi$ : $\beta$ transition from (4 <sup>-</sup> ) is possibly allowed; gammas to 2 <sup>+</sup> and (3 <sup>-</sup> ).   |

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $^{34}\text{Si}$  Levels (continued)

| E(level)   | $J^\pi$   | XREF  | Comments   |
|------------|---|-------|--|
| 4520.2? 11 |   | A CDE |  |
| 4971.1 5   | (3 <sup>-</sup> ,4 <sup>-</sup> ,5 <sup>-</sup> ) | A CDE | XREF: E(?).<br>$J^\pi$ : log $ft$ =5.7 from (4 <sup>-</sup> ).   |
| 5042.2? 11 |   | A CDE |  |
| 5330.4 10  | 2 <sup>+</sup>                                    | D G   | Measured angular distribution compared with theoretical predictions for $\Delta L=0$ transition ( $^7\text{Li}(^{34}\text{P},^7\text{Be}\gamma)$ ).<br>Deduced $B(>)=0.74$ 18(stat) +00-14(syst) ( $^7\text{Li}(^{34}\text{P},^7\text{Be}\gamma)$ ). |
| 6023.3? 11 |   | A CDE |  |

 $\gamma(^{34}\text{Si})$ 

| $E_i(\text{level})$ | $J_i^\pi$   | $E_\gamma^\dagger$  | $I_\gamma^\dagger$ | $E_f$   | $J_f^\pi$         | Mult.   | $\alpha^\ddagger$ | Comments   |
|---------------------|---|---------------------|--------------------|---------|-------------------|---------|-------------------|--|
| 3327.14             | 2 <sup>+</sup>                                    | 3326.96 20          | 100                | 0.0     | 0 <sup>+</sup>    | [E2]    |                   | B(E2)(W.u.)=2.6 10   |
| 4256.1              | (3 <sup>-</sup> )                                 | 929.0 3<br>4257 3   | 100 10<br>22 3     | 3327.14 | 2 <sup>+</sup>    | [E3]    |                   | $I_\gamma$ : other: $I_\gamma(4257)/I_\gamma(929)=0.53$ 4 in $^2\text{H}(^{34}\text{Si},^{34}\text{Si}'\gamma)$ is too high by a factor of $\approx 2$ . |
| 4380.2              | (3 <sup>-</sup> )                                 | 124.2 3<br>1052.8 4 | 100 8<br>7.5 12    | 4256.1  | (3 <sup>-</sup> ) | [M1+E2] | 0.025 23          | $\alpha(\text{K})=0.023$ 22; $\alpha(\text{L})=0.0017$ 16  |
| 4520.2?             |   | 1193.34 20          | 100                | 3327.14 | 2 <sup>+</sup>    |         |                   |  |
| 4971.1              | (3 <sup>-</sup> ,4 <sup>-</sup> ,5 <sup>-</sup> ) | 590.9 3             | 100                | 4380.2  | (3 <sup>-</sup> ) |         |                   |  |
| 5042.2?             |   | 1715.4 8            | 100                | 3327.14 | 2 <sup>+</sup>    |         |                   |  |
| 5330.4              | 2 <sup>+</sup>                                    | 2000#               | 59 9               | 3327.14 | 2 <sup>+</sup>    |         |                   | $E_\gamma, I_\gamma$ : from $^7\text{Li}(^{34}\text{P},^7\text{Be}\gamma)$ .   |
|                     |   | 5330                | 100                | 0.0     | 0 <sup>+</sup>    |         |                   | $E_\gamma, I_\gamma$ : from $^7\text{Li}(^{34}\text{P},^7\text{Be}\gamma)$ .   |
| 6023.3?             |   | 2696.4 12           | 100                | 3327.14 | 2 <sup>+</sup>    |         |                   |  |

<sup>†</sup> From  $^{34}\text{Al}$   $\beta^-$  decay, unless otherwise stated.

<sup>‡</sup> Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on  $\gamma$ -ray energies, assigned multiplicities, and mixing ratios, unless otherwise specified.

# Placement of transition in the level scheme is uncertain.

**Adopted Levels, Gammas**

Legend

Level Scheme

Intensities: Relative photon branching from each level

-----►  $\gamma$  Decay (Uncertain)