## $^{40}$Ca($^{28}$Si,3$\alpha\gamma$) 2006Jo03

History

| Type | Author | Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | Huo Junde, Huo Su, Yang Dong | NDS 112, 1513 (2011) | 29-Oct-2009 |

E=122 MeV. Measured E$\gamma$, I$\gamma$, $\gamma\gamma$, $\gamma\gamma(\theta)$, $\alpha\gamma$ coin using Gammasphere of 101 Compton-suppressed Ge detectors for $\gamma$ rays and 4$\pi$ CsI Microball array for charged particles.

### $^{56}$Ni Levels

| E(level)† | Jπ‡ | E(level)† | Jπ‡ | E(level)† | Jπ‡ | E(level)† | Jπ‡ |
|---|---|---|---|---|---|---|---|
| 0.0@ | $0^+$ | 7954.7@ *15* | $8^+$ | 10933.7a *20* | (9)# | 13576.8& *23* | $(12^+)$# |
| 2700.3@ *9* | $2^+$ | 8223.7 *16* | $8^+$ | 11001.8 *18* | $(10^+)$ | 13644 *3* | $(12^+)$ |
| 3924.3@ *12* | $4^+$ | 8778.5 *17* | (7) | 11294.7& *20* | $(10^+)$# | 14449.8a *25* | (13)# |
| 5316.3@ *15* | $6^+$ | 9009.7 *17* | $9^+$ | 11420.6 *17* | $11^+$ | 14735.9@ *20* | $(14^+)$ |
| 5350.5& *11* | $(2^+)$# | 9307.7& *18* | $(8^+)$# | 11866.7 *22* | $(10^+)$ | 16354?& *3* | $(14^+)$# |
| 6326.5& *11* | $(4^+)$# | 9418.3@ *17* | $10^+$ | 12358.8@ *18* | $12^+$ | 16768a *4* | (15)# |
| 6650.5 *15* | $6^+$ | 9477.7 *17* | $(9^+)$ | 12504.7a *23* | (11)# | | |
| 7601.4 *17* | $(7^+)$ | 10469.7 *18* | 9 | 12758.4 *18* | $(12^+)$ | | |
| 7652.7& *14* | $(6^+)$# | 10677.3 *17* | $10^+$ | 13505.7 *18* | (12) | | |

† From least-squares fit to E$\gamma$'s.
‡ From multipolarity of gamma-rays.
# From 1999Ru01.
@ Band(A): g.s. band.
& Band(B): Band based on $(2^+)$.
a Band(C): Band based on (9).

### $\gamma$($^{56}$Ni)

| E$\gamma$ | I$\gamma$ | E$_i$(level) | J$_i^\pi$ | E$_f$ | J$_f^\pi$ | Mult.† | Comments |
|---|---|---|---|---|---|---|---|
| 787 *1* | 4.5 *6* | 9009.7 | $9^+$ | 8223.7 | $8^+$ | E2+M1 | $R_{30-83}$=0.6 *1*. |
| 976 *1* | 7.4 *18* | 6326.5 | $(4^+)$ | 5350.5 | $(2^+)$ | (E2) | |
| 1055 *1* | 8.8 *8* | 9009.7 | $9^+$ | 7954.7 | $8^+$ | E2+M1 | $R_{30-83}$=0.5 *1*. |
| 1146 *1* | 2.8 *5* | 13505.7 | (12) | 12358.8 | $12^+$ | | Mult.: ΔJ=0. $R_{30-83}$=0.8 *2*. |
| 1224 *1* | 83 *3* | 3924.3 | $4^+$ | 2700.3 | $2^+$ | E2 | $R_{30-83}$=1.3 *1*. |
| 1254‡ *2* | 1.2 *7* | 9477.7 | $(9^+)$ | 8223.7 | $8^+$ | | |
| 1304 *1* | 3.5 *5* | 7954.7 | $8^+$ | 6650.5 | $6^+$ | E2 | $R_{30-83}$=1.3 *3*. |
| 1326 *1* | 10 *3* | 7652.7 | $(6^+)$ | 6326.5 | $(4^+)$ | (E2) | |
| 1392 *1* | 81 *4* | 5316.3 | $6^+$ | 3924.3 | $4^+$ | E2 | $R_{30-83}$=1.4 *1*. |
| 1463 *1* | 48 *3* | 9418.3 | $10^+$ | 7954.7 | $8^+$ | E2 | $R_{30-83}$=1.4 *1*. |
| 1523 *1* | 2.1 *5* | 9477.7 | $(9^+)$ | 7954.7 | $8^+$ | (E2+M1) | $R_{30-83}$=1.6 *3*. |
| 1571 *1* | 4.2 *9* | 12504.7 | (11) | 10933.7 | (9) | | |
| 1626 *1* | 4.6 *9* | 10933.7 | (9) | 9307.7 | $(8^+)$ | | |
| 1655 *1* | 8 *3* | 9307.7 | $(8^+)$ | 7652.7 | $(6^+)$ | | |
| 1681 *1* | 5.4 *6* | 12358.8 | $12^+$ | 10677.3 | $10^+$ | E2 | $R_{30-83}$=1.2 *2*. |
| 1876 *2* | <1 | 9477.7 | $(9^+)$ | 7601.4 | $(7^+)$ | | |
| 1945 *1* | 3.7 *8* | 14449.8 | (13) | 12504.7 | (11) | | |
| 1987 *1* | 4.6 *22* | 11294.7 | $(10^+)$ | 9307.7 | $(8^+)$ | | |
| 2002 *1* | 7.6 *10* | 11420.6 | $11^+$ | 9418.3 | $10^+$ | E2+M1 | $R_{30-83}$=1.6 *5*. |
| 2081 *1* | 1.7 *7* | 12758.4 | $(12^+)$ | 10677.3 | $10^+$ | | E$\gamma$: 2801 in table 1 of 2006Jo03 is a misprint. |

Continued on next page (footnotes at end of table)

## $^{40}$Ca($^{28}$Si,3$\alpha\gamma$) 2006Jo03 (continued)

### $\gamma(^{56}Ni)$ (continued)

| $E_\gamma$ | $I_\gamma$ | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | Mult.[†] | Comments |
|---|---|---|---|---|---|---|---|
| 2086 *1* | 4.6 *7* | 13505.7 | (12) | 11420.6 | $11^+$ | | Mult.: ΔJ=1.<br>$R_{30-83}$=0.8 *3*. |
| 2282 *1* | 2.8 *14* | 13576.8 | $(12^+)$ | 11294.7 | $(10^+)$ | | |
| 2285 *1* | 10 *2* | 7601.4 | $(7^+)$ | 5316.3 | $6^+$ | (E2+M1) | $R_{30-83}$>1.0. |
| 2318 *2* | <1 | 16768 | (15) | 14449.8 | (13) | | |
| 2377 *1* | 11 *3* | 14735.9 | $(14^+)$ | 12358.8 | $12^+$ | (E2) | $R_{30-83}$=1.1 *1*. |
| 2402 *1* | 4.3 *21* | 6326.5 | $(4^+)$ | 3924.3 | $4^+$ | | Mult.: ΔJ=(0). |
| 2412 *1* | 5.8 *11* | 11420.6 | $11^+$ | 9009.7 | $9^+$ | E2 | $R_{30-83}$=0.9 *1*. |
| 2453 *1* | 8.0 *9* | 10677.3 | $10^+$ | 8223.7 | $8^+$ | E2 | $R_{30-83}$=1.1 *2*. |
| 2515 *1* | 4.4 *7* | 10469.7 | 9 | 7954.7 | $8^+$ | | Mult.: ΔJ=1.<br>$R_{30-83}$=0.6 *2*. |
| 2626[‡] *2* | <1 | 11866.7 | $(10^+)$ | | | | |
| 2638 *1* | 65 *3* | 7954.7 | $8^+$ | 5316.3 | $6^+$ | E2 | $R_{30-83}$=1.3 *1*. |
| 2650 *1* | 3.3 *8* | 5350.5 | $(2^+)$ | 2700.3 | $2^+$ | | Mult.: ΔJ=0. |
| 2700 *1* | 100 *4* | 2700.3 | $2^+$ | 0.0 | $0^+$ | E2 | $R_{30-83}$=1.3 *1*. |
| 2726 *1* | 4.1 *7* | 6650.5 | $6^+$ | 3924.3 | $4^+$ | E2 | $R_{30-83}$=1.4 *4*. |
| 2777[‡] *2* | <1 | 16354? | $(14^+)$ | 13576.8 | $(12^+)$ | | |
| 2908 *1* | 13 *1* | 8223.7 | $8^+$ | 5316.3 | $6^+$ | E2 | $R_{30-83}$=1.3 *1*. |
| 2940 *1* | 19 *2* | 12358.8 | $12^+$ | 9418.3 | $10^+$ | E2 | $R_{30-83}$=1.5 *1*. |
| 3047 *1* | 2.0 *5* | 11001.8 | $(10^+)$ | 7954.7 | $8^+$ | (E2) | |
| 3340 *1* | 8.4 *9* | 12758.4 | $(12^+)$ | 9418.3 | $10^+$ | (E2) | $R_{30-83}$=1.6 *3*. |
| 3462 *1* | <1 | 8778.5 | (7) | 5316.3 | $6^+$ | | |
| 3626 *1* | 10 *2* | 6326.5 | $(4^+)$ | 2700.3 | $2^+$ | (E2) | |
| 3729 *2* | 0.8 *4* | 7652.7 | $(6^+)$ | 3924.3 | $4^+$ | (E2) | |
| 3912 *2* | 2.8 *6* | 11866.7 | $(10^+)$ | 7954.7 | $8^+$ | (E2) | $R_{30-83}$=1.0 *3*. |
| 4226 *2* | 1.2 *5* | 13644 | $(12^+)$ | 9418.3 | $10^+$ | | |
| 5351 *2* | 5.3 *4* | 5350.5 | $(2^+)$ | 0.0 | $0^+$ | E2 | $R_{30-83}$=1.6 *1*. |

[†] From $R_{30-83}$=Iγ(30°)/Iγ(83°) deduced from γγ matrix. Value of ≈1.3 is expected for ΔJ=2, stretched quadrupole and ≈0.8 for ΔJ=1, dipole transitions. Values quite different from two suggest ΔJ=1 or 0 with M1+E2 admixtures.

[‡] Placement of transition in the level scheme is uncertain.

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Level Scheme

Intensities: Relative $I_\gamma$

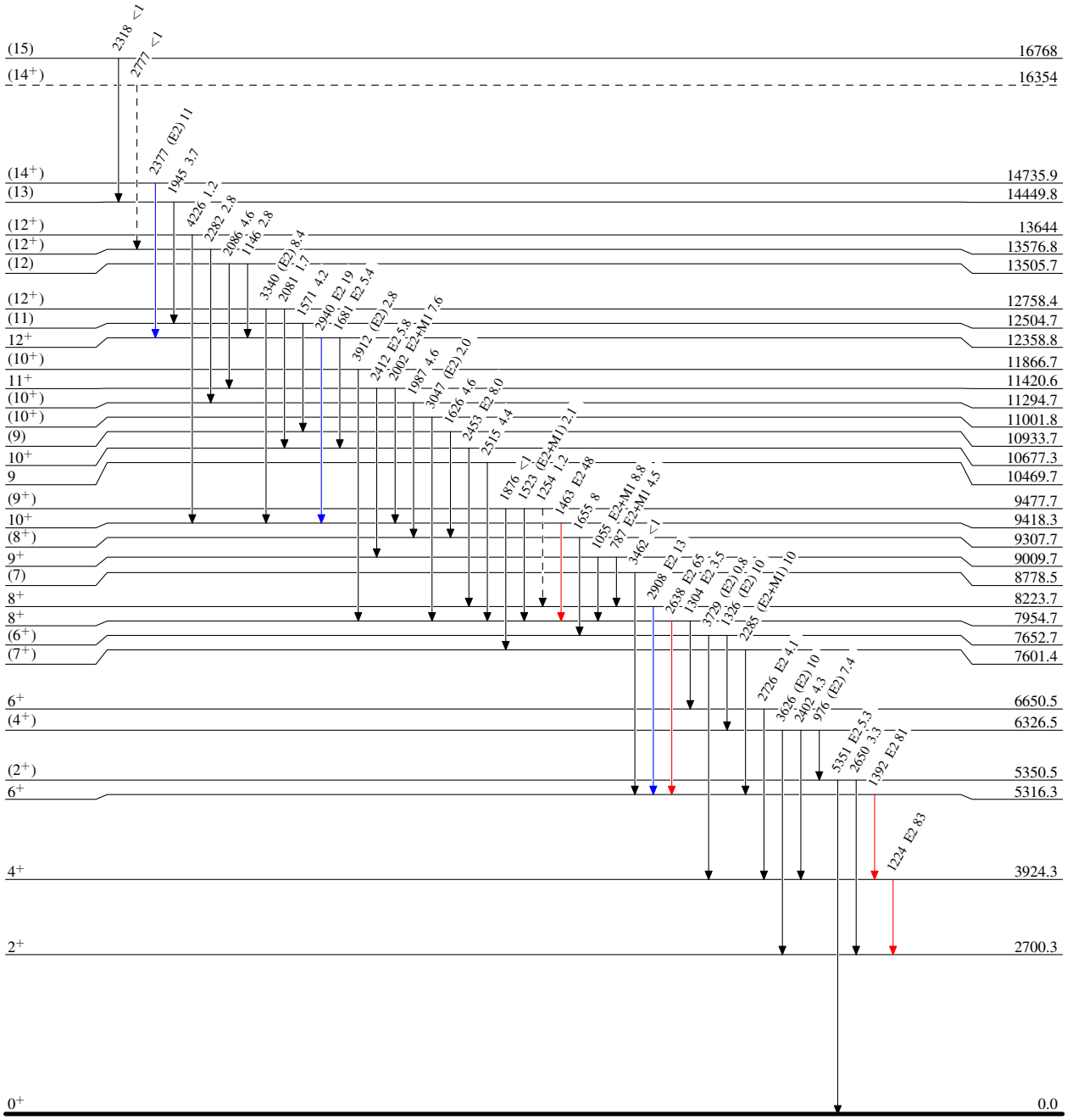
Legend

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

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

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

$\gamma$ Decay (Uncertain)




$^{56}_{28}Ni_{28}$

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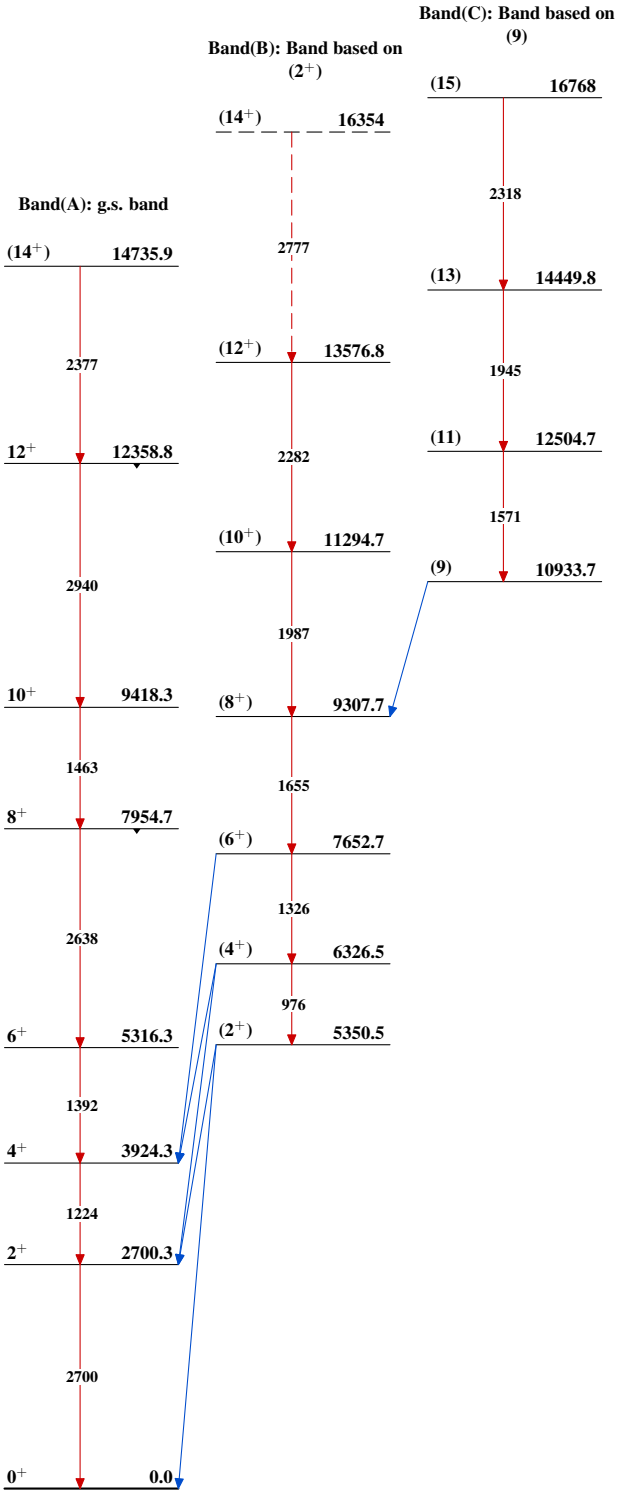


$^{56}_{28}Ni_{28}$