Coulomb excitation

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	G. Gürdal, E. A. Mccutchan	NDS 136, 1 (2016)	1-Jul-2016

2013Gu23: E(^{70}Ge) at 196, 225 MeV provided by ESTU tandem accelerator at YALE. Targets: multilayer C or Mg in front, Gd or Fe in the middle, and Ta+Cu at the back. Total of three targets were used with thicknesses 0.42, 0.44, 0.45 mg/cm^2 for C; 0.5, 0.9 mg/cm^2 for Mg; 3.24, 3.34, 4.0 mg/cm^2 for Gd; 1.0, 1.1, 1.4 mg/cm^2 for Ta; and 3.51, 3.90, 4.49, 4.92, 5.40 mg/cm^2 for Cu. γ-rays were detected using four HPGe detectors. Charged particles were detected using silicon detectors. Measured: Eγ, (particle)γ coin, $\sigma(\theta)$, precession angles. Deduced g factors by Transient Field technique.

2007Bo41: E(^{70}Ge) at 190,225 MeV beam provided by ESTU tandem accelerator at Yale. Target: multilayer consisting of 0.42 mg/cm^2 C deposited on successive layers of 5 mg/cm^2 Ti and 3.24 mg/cm^2 Ga evaporated onto 1.4 mg/cm^2 Ta backed by 3.5 mg/cm^2 of Cu.γ-rays were detected using four HPGe detectors. Charged particles were detected using silicon detectors. Measured: Eγ, (particle)γ coin, $\sigma(\theta)$. Deduced g factors by Transient Field technique.

2003Su01: ^{70}Ge beam provided by tandem accelerator at JAERI. The beam was impinged on a thick natural Pb target. γ-rays were detected using Compton-suppressed 12 HPGe detectors. The scattered ^{70}Ge was detected with a position-sensitive detector. Measured: $\gamma(\theta)$. Deduced matrix elements for six low-lying states.

1987La20: ^{34}Si beam at 75 MeV provided by Australian National University 14 UD Pelletron accelerator and incident upon a multilayer target (natural Ge target backed with Fe and Cu, respectively). Four Ge detectors were used to detect γ-rays and backscattered beam ions were detected using annular surface-barrier surface counter. Measured: $\gamma(\theta)$; deduced g-factors using TF technique.

1983Uh01: E(^{16}O)=37.0-52.5 MeV, E(^{18}O)=31.5-57.0 MeV, FWHM=75-200 keV; measured $\sigma(\theta)$ for elastic and inelastic scattering from θ(lab)=30°−175°; DWBA analysis.

1980Le24: E(^{16}O)=36-42 MeV; 98.4% enriched thick ^{70}Ge used as a target. One Ge(Li) detector used to detect γ-rays. Measured: Eγ, Iγ.

1980Le16: E(^{16}O)=29.9 MeV, E(^{6}Li)=10.5 MeV. The beams provided by the Universite de Montreal Tandem accelerator. The scattered particles were detected by four surface-barrier detectors. Measured: elastic and inelastic scattering at ±157.5° and ±172.5°.

1977Fa07: E(^{16}O)=36 MeV; measured $\gamma(\theta$,H,t) in polarized Gd at 80° K; Reanalysis of data to deduce g-factors from IMPAC measurements in 1969He11.

1974Hu01: E(^{16}O)=33-38 MeV provided by Rutgers-Bell tandem accelerator. γ-rays were detected using NaI detectors. Backscattered particles were detected using an annular Si detector. Measured: $\gamma(\theta)$. Reanalysis of data to deduce g-factors from IMPAC measurements in 1969He11.

1969He11: E(^{16}O)=33-38 MeV. Measured: $\gamma\gamma(\theta$,H); IMPAC.

1967Kr01: E(^{16}O)=30-37.5 MeV. Measured σ.

1984Pa20: E(^{28}Si)=47.3-62.1 MeV provided by Oxford Folded tandem accelerator. γ-rays were detected using four NaI and one Ge(Li) detector. Measured: $\gamma(\theta$,H); deduced g-factors using Transient Field technique.

1972Si06: E(^{35}Cl)=60-83 MeV, and E(^{32}S)=75.7 MeV. Measured: σ(Eγ), Eγ, γ yield ratios.

1969Si15: Eα=5-11 MeV, FWHM=20-25 keV; E(^{16}O)=25, 34-43 MeV, FWHM= 100 keV; measured Coulomb excitation probabilities.

1965Ro09: Eα=6-9 MeV. Measured: Eγ.

1962St02: Eα=3-10 MeV. Measured: γ yield.

^{70}Ge Levels

E(level)[†]	J$^\pi$[#]	T$_{1/2}$[@]	Comments
0.0	0$^+$		
1039.5 *5*	2$^+$	1.31 ps *2*	B(E2)↑=0.179 *3*; g=+0.455 *26* B(E2)↑: from 1980Le16. Others: B(E2)=0.179 *3* (1983Uh01); B(E2)=0.179 *3*; B(E2)=0.172 *21* (1962St02). g: from weighted average of 0.44 *4* (2013Gu23, using TF), 0.45 *8* (2007Bo41, using TF), 0.370 *89* (1987La20, using TF), 0.468 *26* (1984Pa20, using TF) and 0.47 *10* (1977Fa07, using IMPAC). Others: 0.38 *8* (1977Fa07), 0.59 *29* (1969He11); the same data reanalyzed by 1974Hu01 gave g=0.88 *21*; the same data reanalyzed by 1977Fa07 according to the latest understanding of the

Continued on next page (footnotes at end of table)

Coulomb excitation (continued)

^{70}Ge Levels (continued)

E(level)[†]	J$^\pi$[#]	$T_{1/2}$[@]	Comments
			experiment and corrections give g=0.47 *10* (this value is included in the weighted average). Q=+0.04 3 from multistep Coulomb excitation in 2003Su01; Q=+0.03 *6* from multistep Coulomb excitation in 1980Le16 and correspond to considering ^{70}Ge to be almost spherical; if it is considered as a moderately deformed oblate spheroid the same data give B(E2)=0.178 *3* and Q=+0.09 *6*; Q=+0.003 *100* (1969Si15).
1215.6 *5*	0$^+$	4.8 ns *7*	B(E2)↑=0.014 *2* B(E2)↑: Coulomb excitation from 1039.5 to 1215.6 level; weighted average of 0.0158 *24* (1972Si06) and 0.012 *3* (1980Le24). $T_{1/2}$: Deduced from B(E2).
1708.2 *5*	2$^+$	4.2 ps *+26−14*	B(E2)↑=0.0013 *10*; g=+0.66 *37* (2013Gu23) g: weighted average of +0.39 *37* and +1.03 *44* for two targets and two beam energies in 2013Gu23 using TF. B(E2)↑: for Coulomb excitation from g.s. to 1708.2 level (1980Le24). B(E2)(1040 to 1708)=0.050 *19*; B(E2)(1216 to 1708)=0.018 *16* (1980Le24). $T_{1/2}$: from B(E2) for Coulomb excitation from 1039.5 to 1708.2 level with a branching fraction of 0.53 for the 669 transition from adopted γ's. Other: 5.4 ps *+53 − 18* in 1980Le24. Q: =−0.07 4 from multistep Coulomb Excitation in 2003Su01.
2153.6 *5*	4$^+$	1.7 ps *4*	Q=+0.22 *5* (2003Su01); B(E2)↑=0.034 *7*; g=+0.42 *20* g: weighted average of +0.21 *63* and +0.22 *36* for two targets and two beam energies (2013Gu23, using TF) and 0.5 *2* (2007Bo41, using TF). B(E2)↑: for Coulomb excitation from 1040 to 2154 level.
2157.5[‡]	2$^+$		Q=+0.26 *10* (2003Su01)
2562.5 *5*	3$^-$		B(E3)↑=0.068; g=0.1 *3* (2007Bo41) B(E3)↑: from 1983Uh01; authors state that large uncertainties in data and possible defects in the first order DWBA do not allow a precise determination of B(E3). Other: 0.043 *3* (1980Le24).

[†] From a least squares fit to Eγ's by the evaluators.
[‡] From 2003Su01.
[#] From Adopted Levels.
[@] Deduced from reduced transition probabilities in 1980Le24, unless otherwise stated.

γ(^{70}Ge)

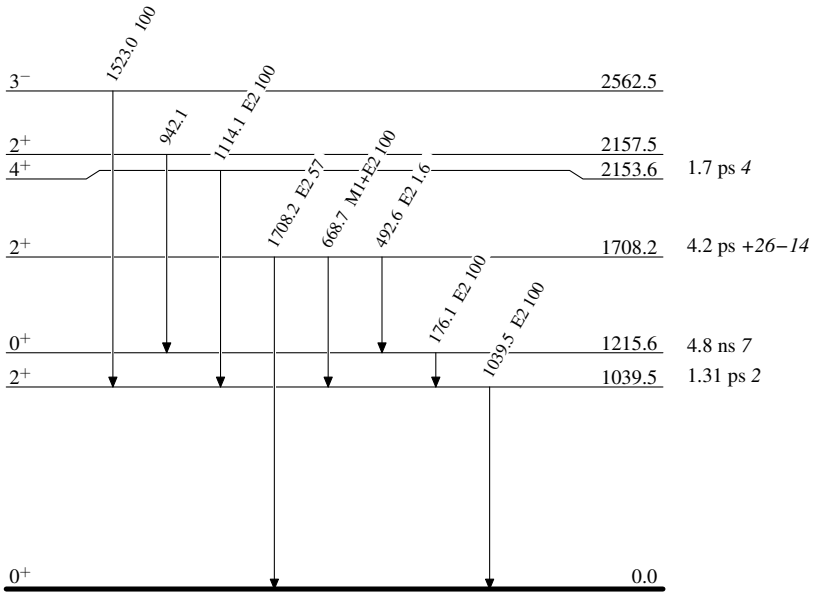
E_i(level)	J_i^π	E_γ[‡]	I_γ[†]	E_f	J_f^π	Mult.[#]	Comments
1039.5	2$^+$	1039.5 *5*	100	0.0	0$^+$	E2	
1215.6	0$^+$	176.1 *5*	100	1039.5	2$^+$	E2	
1708.2	2$^+$	492.6 *5*	1.6 *5*	1215.6	0$^+$	E2	Authors (1980Le24) stated that the energy and intensity of this transition taken from (p,p′γ) (1969Hi01).
		668.7 *5*	100	1039.5	2$^+$	M1+E2	
		1708.2 *5*	57 *11*	0.0	0$^+$	E2	
2153.6	4$^+$	1114.1 *5*	100	1039.5	2$^+$	E2	
2157.5	2$^+$	942.1		1215.6	0$^+$		
2562.5	3$^-$	1523.0 *5*	100	1039.5	2$^+$		

[†] Relative photon branching from each level (1980Le24).
[‡] From 1980Le24, unless otherwise stated.
[#] From Adopted Levels.

Coulomb excitation

Level Scheme

Intensities: Relative photon branching from each level



$^{70}_{32}Ge_{38}$