Coulomb excitation 2015Li28,1999Pr09,1995Mo16

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 201,1 (2025)	31-Oct-2024

2015Li28: ^{208}Pb(^{32}Mg,^{32}Mg′γ) E≈213 MeV/nucleon (≈195 MeV/nucleon at the center of the target) ^{32}Mg beam was produced by fragmentation of a 345 MeV/nucleon primary ^{48}Ca beam from RIBF on a ^{9}Be target at RIKEN. Fragments were separated and identified with the BigRIPS fragment separator through ΔE-Bρ-tof technique. The reaction target was 3.37 g/cm^2 lead. γ rays were detected with the DALI2 array of 177 NaI(Tl) detectors; scattered particles were analyzed using ZeroDegree spectrometer (ZDS) based on ΔE-Bρ-tof technique. Measured Eγ, Iγ, (scattered ^{32}Mg)γ-coin, $\gamma(\theta)$. Deduced B(E2) for the first 2$^+$ state. Nuclear excitation effects and corrections were evaluated from a separate proton inelastic scattering experiment in inverse kinematics.

1999Pr09 (also 2002Gl01): ^{197}Au(^{32}Mg,^{32}Mg′γ) E=57.8 MeV/nucleon ^{32}Mg beam was produced from the cyclotron at NSCL. Target was a 702 mg/cm^2 gold foil. γ rays were detected with a NaI(Tl) array. Measured Eγ, Iγ, particle-γ-coin. Deduced B(E2). Comparisons with available data and theoretical calculations.

1995Mo16 (also 1998Mo18): ^{208}Pb(^{32}Mg,^{32}Mg′γ) E=49.2 MeV/nucleon ^{32}Mg beam was produced by fragmentation of a 94 MeV/nucleon ^{40}Ar primary beam on a 443 mg/cm^2 ^{9}Be target at RIKEN. Fragments were analyzed with the RIPS separator. The reaction target was 350 mg/cm^2 ^{208}Pb. Scattered particles were detected with a silicon counter telescope; γ rays were detected with the DALI array of 60 Na(Tl) detectors. Measured Eγ, Iγ, particle-γ-coin. Deduced B(E2).

2001Ch56 (also 2001Ch11): E=37 MeV ^{32}Mg secondary beam was produced by fragmentation of a 77 MeV/nucleon ^{36}S primary beam at GANIL facility. γ rays were detected with two sets of 7 hexagonal NaI detectors. Measured Eγ, Iγ, particle-γ-coin, $\sigma(\theta)$. Deduced transition strength and deformation parameter.

Others:

2005Ch66: ^{197}Au(^{32}Mg,^{32}Mg′γ) E=81.1 MV/nucleon ^{32}Mg beam was produced by fragmentation of 110 MeV/nucleon ^{48}Ca primary beam from the coupled cyclotron on a ^{9}Be target at NSCL. Fragments were separated by the A1900 fragment separator. The reaction target was 968 mg/cm^2 ^{197}Au. γ rays were detected with an array of 24 position-sensitive trapezoidal NaI(Tl) detectors. Measured Eγ, Iγ, σ(Eγ). Deduced B(E2) for first excited 2$^+$ state. Intermediate energy Coulomb excitation.

2005NiZS: ^{107}Ag(^{32}Mg,^{32}Mg′γ) E=2.84 MeV/nucleon ^{32}Mg beam was produced from the REX-ISOLDE facility at CERN. Target was 4.4 mg/cm^2 ^{107}Ag. Scattered particles were detected with a ΔE silicon detector and γ rays were detected with the MINIBALL array. Measured Eγ, Iγ. Deduced B(E2).

2001Iw07: ^{208}Pb(^{32}Mg,^{32}Mg′γ) E=44.0 MeV/nucleon ^{32}Mg beam was produced from fragmentation of ^{40}Ar beam with ^{9}Be target at RIKEN facility using RIPS spectrometer. γ rays were detected with an array of 66 NaI(Tl) detectors. Measured Eγ, Iγ. Deduced B(E2).

2006SuZX: ^{197}Au(^{32}Mg,^{32}Mg′γ) E=26.1 MeV/nucleon ^{32}Mg beam was produced from fragmentation of ^{40}Ar beam at 95 MeV/nucleon with a ^{9}Be target at RIKEN. Measured lifetime by recoil-distance Doppler method in intermediate energy Coulomb excitation process. The ^{32}Mg scattered particles were measured by ΔE-E detector telescope. The γ rays were measured using GRAPE Ge detector array. No lifetime results are available as yet.

^{32}Mg Levels

E(level)[†]	J$^\pi$[‡]	Comments
0	0$^+$	
885 *9*	2$^+$	B(E2)↑=0.0440 *51* J$^\pi$: from Adopted Levels. B(E2)↑: weighted average of 0.0432 *51* (2015Li28), 0.0622 *90* (2001Ch56), 0.0333 *70* (1999Pr09), and 0.0454 *78* (1995Mo16), all with correction for feeding from possible higher states. See below for other values with no such correction. B(E2)=0.0432 *51* with a correction of estimated 11.2 mb *27* (14% *3* of observed 885γ yield) for feedings from possible higher levels (2015Li28). B(E2)=0.0622 *90* from σ=505 mb *73* with a correction of estimated 44 mb *10* for feeding from possible higher states; deformation parameter β_C=0.610 *44* (2001Ch56). B(E2)=0.0333 *70* from σ=80 mb *17* with correction for feeding by 1430γ from 2320 level, and 0.0440 *55* without such correction (1999Pr09). B(E2)=0.0454 *78* from σ=92 mb *15* with a 5% correction for feeding by 1430γ from 2320 level; deformation parameter β_C=0.512 *44* (1995Mo16). B(E2)=0.0449 *53* from σ=217 mb *23*, with no correction for feedings from possible higher states (2001Iw07).

Continued on next page (footnotes at end of table)

Coulomb excitation 2015Li28,1999Pr09,1995Mo16 (continued)

^{32}Mg Levels (continued)

E(level)†	Jπ‡	Comments
		B(E2)=0.0447 *57* from σ=91 mb *10* if no correction for feeding from 2321 level is applied, >0.0328 *48* if possible correction for feeding from the 2321 level is considered (2005Ch66).
		B(E2)=0.0434 *52* (2005NiZS), measured relative to those of excitation of 324.8, 3/2$^-$ and 423.2, 5/2$^-$ levels in ^{107}Ag (g.s. J^π=1/2$^-$), low-energy Coulomb excitation; deformation parameter β_C=0.501 *30* (2005NiZS).
2323 *15*	4$^+$	Jπ: (1$^-$,2$^+$) proposed by 2005Ch66 based on the argument that direct excitation of a 4$^+$ is less likely in intermediate energy Coul. ex. 4$^+$ or 3$^-$ are proposed in other studies, see e.g. 2003Ba52 in two-proton knockout reaction and 3$^-$ in inelastic scattering (2002Mi44).
		σ=15 mb *5* (2002Mi44,2002Mi48).

† From Eγ data.
‡ From Adopted Levels.

γ(^{32}Mg)

Eγ	Ei(level)	J_i^π	E_f	J_f^π	Comments
885 *9*	885	2$^+$	0	0$^+$	Eγ: from 1999Pr09. Other: 885 *18* (2005Ch66), 895 *10* (2006SuZX).
1438 *12*	2323	4$^+$	885	2$^+$	Eγ: from 1999Pr09. This γ ray is only weakly populated in the study by 2005Ch66.

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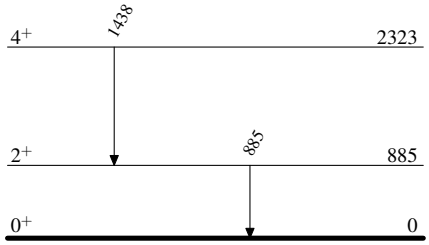
Level Scheme



$^{32}_{12}Mg_{20}$