Coulomb excitation 2000Er01,2000Er06

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 179, 1 (2022)	30-Nov-2021

$^{12}C(^{48}Ti,^{48}Ti'\gamma)$:

2000Er01,2000Er06: E=110-120 MeV ^{48}Ti beams from the Tandem accelerator at Cologne and Munich. Target was 0.75 mg/cm^2 natural carbon over 3.6 mg/cm^2 of gadolinium deposited on a 1 mg/cm^2 tantalum foil backed by a 3.6 mg/cm^2 Cu layer. γ rays were detected with NaI(Tl), BaF_2 and Ge detectors; charged particles were detected with a Si counter. Measured Eγ, particle-γ-coin, $\gamma(\theta$,H,t), and Doppler-shift attenuation. Deduced g-factors, $T_{1/2}$, transition strengths. Comparisons with available data and shell-model calculations. 2000Er06 extend the results of 2000Er01 to include the measured τ(2421).

$(\alpha,\alpha'\gamma)$:

1956Te26: E=6 MeV α beam from the pressurized electrostatic generator of the Carnegie Institution of Washington. Measured Eγ, γ-ray yields with a NaI(Tl) crystal. Deduced B(E2) for 983 level.

1965Ro09: E=6-9 MeV α beams from the Oak Ridge 5-MV Van de Graaff. Measured Eγ for 983γ with a Ge(Li) detector.

1973Ba02: E=5.0 MeV α beam from The Stanford University tandem Van de Graaff. Target was 99% enriched metallic ^{48}Ti. γ rays were detected with a Ge(Li) detector. Measured Eγ, Iγ, Doppler-shift attenuation. Deduced $T_{1/2}$ for 2295 level.

$(^{12}C,^{12}C'\gamma)$:

1967Af03: E=36.8 MeV ^{12}C beam. Measured ^{12}C-γ coincidences with annular NaI detectors at 0° and 90°. Deduced B(E2) for 983 level.

$(^{14}N,^{14}N'\gamma)$:

1959Al95: E=16-35 MeV ^{14}N beams from the cyclotron at PTI, USSR. Measured γ-ray yield with a NaI(Tl) detector. Deduced B(E2) for 983 level.

1960An07: E=16-36 MeV ^{14}N beams from the cyclotron at PTI, USSR. Measured γ-ray yields with a NaI(Tl) detector. Deduced B(E2) for 983 level.

$(^{16}O,^{16}O')$:

1971De29: E=26-31 MeV ^{16}O beams from the Tandem Van de Graaff at University of Montreal. Measured $\sigma(\theta$=40° to 135°), reorientation effect with a Si detector. Deduced B(E2) and static quadrupole moment for 983 level.

1972WaYZ: E=21-30 MeV ^{16}O beams. Measured $T_{1/2}$(DSAM) and B(E2)↑, also with ^{35}Cl beams. Details not available.

1981Sh19: E=30 MeV ^{16}O beam from the Rutgers-Bell tandem accelerator. γ rays were detected with four NaI(Tl) detectors; charged particles were detected with an annular Si detector. Measured Eγ, $\gamma\gamma$-coin, precession of coincident γ due to external magnetic field. Deduced factor for 983 level.

$(^{32}S,^{32}S'\gamma)$:

1972Le19: E=60 MeV ^{32}S beam from the University of Rochester model MP tandem Van de Graaff accelerator. γ rays were detected with four NaI(Tl) detectors and charged particles were detected with four particle detectors. Measured ^{32}S-γ coincidences, reorientation effect. Deduced quadrupole moments for 983 level.

$(^{35}Cl,^{35}Cl'\gamma)$:

1970Ha24: E=70.35-74.00 MeV ^{35}Cl beams from the Chalk River MP Tandem accelerator. γ rays were detected with NaI(Tl) detectors. Measured Eγ, $\gamma(\theta)$, $\gamma\gamma$-coin, γ-ray yields. Deduced B(E2) and quadrupole moment for 983 level.

1970MiZQ: E=35 MeV ^{35}Cl. Measured γ-ray yields. Deduced B(E2) for 983 level.

1972WaYZ: E=60-90 MeV ^{35}Cl beams. Measured $T_{1/2}$(DSAM) and B(E2)↑, also with ^{16}O beams. Details not available.

1973Fi15: E=56-68 MeV ^{35}Cl beams from the Stanford University FN tandem accelerator. Measured Eγ, Doppler-shift attenuation with a Ge(Li) detector. Deduced $T_{1/2}$ for 983 level.

1973Ba02: E=64 MeV ^{35}Cl beam from the Stanford University tandem Van de Graaff. Target was 20 mg/cm^2 metallic 99% enriched ^{48}Ti. γ rays were detected with a Ge(Li) detector. Measured Eγ, Iγ, Doppler-shift attenuation. Deduced $T_{1/2}$ for 983 level.

Coulomb excitation **2000Er01,2000Er06** **(continued)**

^{48}Ti Levels

g-factors are measured using transient fields method (2000Er01,1981Sh19).

E(level)†	Jπ‡	$T_{1/2}$#	Comments
0.0	0^+		
983.1 *15*	2^+	4.15 ps *56*	g=+0.392 *19* (2000Er01); g=+0.43 *19* (1981Sh19) B(E2)↑=0.072 *4* $T_{1/2}$: weighted average of 3.95 ps *61* (2000Er01), 4.16 ps *90* (1973Ba02), 3.67 ps *56* (1972WaYZ), and 5.75 ps *89* (1973Fi15), all by DSAM lineshape analysis. Additional information 1. B(E2)↑: weighted average of 0.10 *2* (1959Al95), 0.070 *14* (1960An07), 0.080 *16* (1967Af03), 0.069 *6* (1970Ha24), 0.081 *8* (1970MiZQ), 0.072 *4* (1971De29) and 0.071 *6* (1972WaYZ), all from γ-ray yields. Other: 0.031 *6* from 1956Te26 is an outlier. Static quadrupole moment Q_2=−0.22 eb *8*, weighted average of −0.38 eb *13* (1971De29), −0.22 eb *8* (1970Ha24), and −0.135 eb *88* (1972Le19).
2295	4^+	0.84 ps *26*	g=+0.54 *13* (2000Er01) $T_{1/2}$: weighted average of 0.76 ps *13* (2000Er01) and 1.66 ps *42* (1973Ba02), both by DSAM lineshape analysis. Both values are used in average for adopted $T_{1/2}$ in Adopted Levels. Additional information 2.
2421	2^+	51 fs *9*	$T_{1/2}$: from DSAM in 2000Er06. Additional information 3.

† From Eγ data.

‡ From Adopted Levels.

Uncertanties from 2000Er01, 2000Er06 and 1973Fi15 do not include the uncertainty due to the stopping power theory (from 10% to 25% quoted in different references) used in their DWBA analysis, for which the evaluator has added an additional 15% uncertainty (as mentioned in 1973Fi15) to uncertainties from references above. Note that 1973Fi15 specifically mention that their quoted uncertainties are statistical only and even though it is not mentioned in 2000Er01 and 2000Er06, their quoted uncertainty in τ(983 level)=5.7 ps *2* is relatively small, 3.5%, much lower than the systematic uncertainty due to the stopping power theory.

γ(^{48}Ti)

E_γ	E_i(level)	J_i^π	E_f	J_f^π	Comments
983.1 *15*	983.1	2^+	0.0	0^+	E_γ: from 1965Ro09.
1313	2295	4^+	983.1	2^+	E_γ: from 1973Ba02. Other: 1312 (2000Er01).
1437	2421	2^+	983.1	2^+	E_γ: from 2000Er01.

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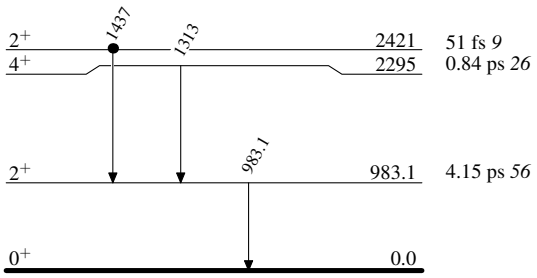
Legend

● Coincidence

Level Scheme



$^{48}_{22}Ti_{26}$