^{12}C(n,n):res

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, C. G. Sheu and J. E. Purcell	NDS 198,1 (2024)	1-Aug-2024

1950Fr61: C(n,x) E=530 keV-4.8 MeV; measured total σ via transmission study.
1951Bo45: ^{12}C(n,n) E=1-3.3 MeV; measured the total σ; resonances were observed around E_n=2.08 and 2.95 MeV.
1953Ne01: C(n,x) E=2.6-13.9 MeV; measured σ(E); several broad resonances are observed.
1956Be98: C(n,x) E=4.3-8.7 MeV; measured σ(E). Peaks are observed around E_n=4.95, 5.4, 7.8 MeV.
1957Bo13: C(n,n) E=3.8-8.1 MeV; measured the total σ of C. Several peaks are observed. Table of σ(E) is given.
1958Wi36: ^{12}C(n,n) E=1.45-4.10 MeV; measured angular distributions, deduced resonances, J, Γ.
1960Br13: ^{12}C(n,n) E=5.6 MeV; the differential elastic scattering cross sections for carbon have been obtained for θ=30° to 150°.
1960Hu02: ^{12}C(n,n) E_n=500 to 1350 keV; measured the total σ in search of resonances. No resonances were observed within the 5% accuracy.
1960Ts02: ^{12}C(n,n) E=3.3-5.0 MeV; several resonances in the cross sections were analyzed to give spin assignments.
1961Bo06: ^{12}C(n,n) E=15-120 MeV; measure rather structureless neutron total cross section at high energies.
1961Fo07: ^{12}C(n,n) E=3.4-16 MeV; observed several sharp peaks in the total σ; deduced E_x, Γ, J.
1963Pi03: ^{12}C(n,n), the elastic scattering of neutrons by ^{12}C has been investigated at low energies.
1963Se13: ^{12}C(n,n) E=3-660 keV; measured total σ via transmission method. No structures were observed.
1964Ma46: C(n,X) E=7.0-14.3 MeV; measured total σ; Presented table of σ(E).
1965Ha21: ^{12}C(n,n) E=17-21 MeV; measured total σ(E) and σ(E,θ) for θ=36°, 51°, 60°, 86°, 123.5° and 139°. Report peak at 19.5 MeV (Γ≈1.1 MeV) in σ(E,θ) data and at 19.6 MeV (Γ≈1.2 MeV) in σ(E).
1966Li03: ^{12}C(n,n) E=3.0-4.7 MeV; measured differential cross sections, level parameters were determined for ^{13}C*(8.2,8.9 MeV).
1968Bo34: ^{12}C(n,nγ) E=14-25 MeV; measured σ(E,θ) for θ=30°, 39.2°, 54.7° and 90°. Deduced high-lying resonances.
1969Da13: ^{12}C(n,X) E=3-8 MeV; measured σ(E). ^{13}C deduced resonances at ^{13}C*(9.5, 9.9, 10.75, 12.1 MeV).
1970CiZY: C(n,X) E=0.5-30 MeV; measured total σ(E). Deduced resonance parameters.
1970De14: ^{12}C(n,n) E=17-20.5 MeV; measured σ(E;En′,θ) for θ≈10° to 150°. Deduced optical model parameters, E_x=23 MeV resonance energy, J, π.
1970UtZZ: C(n,X) E=70 eV-1.5 MeV; measured σ(E); analyzed levels.
1972Ga13: C(n,n) E=3-7 MeV; measured σ(E;θ) for θ=16.3° to 157°; σ(E) tables provided; deduced phase shifts. Deduced J, π, Γ for levels between E_x=8.3 to 11 MeV.
1973Ab07: ^{12}C(n,n) E=1.98-4.64 MeV; measured σ(E;θ) for θ=30° to 150°. Deduced resonances, L, J, π, Γ.
1973Fa06: ^{12}C(n,n) E=2.1-4.7 MeV; measured σ(E), σ(E,θ); calculated phase shifts, polarization P(E,θ). Deduced E_x, Γ.
1973Ho39: ^{12}C(n,n) E=2-5 MeV; θ(lab)=20°−150°; measured P(E,θ); R-function, phase-shift analyses.
1973Kn06: ^{12}C(n,n) E=2.63 MeV; measured total σ, σ(θ) for $\theta_{c.m.}$≈20° to 130°, n-polarization. Deduced phase shifts. The influence of narrow states at E_x=7.50 and 7.55 MeV is discussed.
1975He02: ^{12}C(n,X) E=1 keV-15 MeV; measured total σ. Deduced resonance energies.
1979Sm08: ^{12}C(n,n) E=1.5-4.0 MeV; measured total s(E), σ(θ) for θ≈15° to 175°. Deduced R-function parameters. Multilevel R-matrix analysis.
1980Th07: ^{12}C(n,n),(pol n, n′) E=15-18.25 MeV; measured σ(E,θ), A_y(θ). Mainly focused on ^{13}C, but includes OM analysis finding a dominant $f_{5/2}$ resonance at E_n=15.7 MeV *2* with Γ=0.6 MeV (E_x≈19.4 MeV); the fit was improved by including a $d_{3/2}$ resonance at E_n=15.4 MeV *2* with Γ≈2.2 MeV (E_x≈ 19 MeV).
1980Ci03: C(n,X) E=3-30 MeV; measured total σ. Deduced resonances, Γ, T. Tof. Breit-Wigner analysis.
1983Wo02: ^{12}C(pol. n,n),(pol. n,n′) E=8.9-14.9 MeV; measured A_y(θ) for θ=30° to 150°.
1985To02: ^{12}C(pol. n,n) E=8.91-12 MeV; measured σ(θ) for θ≈30° to 170°, analyzed A_y(θ) from (1983Wo02) and other literature data to carry out a phase-shift analysis. Deduced σ(E), J, π.
1987Hi03: ^{12}C(n,X),(n,n) E≤22 MeV; measured total σ(E), transmission. Deduced resonance energies, Γ, Γ_{n0}. Discussed isospin and likely ^{13}C T=3/2 states at ^{13}C*(15.1, 17.5, 18.1, 20.1 and 21.7 MeV) along with suggested analog states in ^{13}B.
1987To03: ^{12}C(pol. n,n) E=15.55-17.35 MeV; measured analyzing power vs θ. ^{13}C deduced levels, J, π. Phase-shift analysis. Authors indicate more data are needed to further support their results.

Theory:
1968Da31: ^{12}C(n,n) E<5 MeV; analyzed available data; deduced σ, single effective ranges.
1971ClZV: ^{12}C(n,n) E below inelastic threshold; calculated σ(E). ^{13}C levels calculated 2p-1h contributions.

^{12}C(n,n):res (continued)

1971Gr48: ^{12}C(n,n) E=4.4 MeV; analyzed P(n). ^{13}C resonance deduced parity.
1971LeZG: ^{12}C(n,n) E not given; calculated $\sigma(\theta)$, P(θ), phase shifts. ^{13}C calculated resonances, level-width, J, π.
1971We08: ^{12}C(n,n) E=0.5-4 MeV; calculated σ(E). ^{13}C resonances deduced S.
1971WeZQ: ^{12}C(n,n) E not given; analyzed σ(E). ^{13}C deduced resonance parameters. R-matrix, potential-resonance method.
1972Mo45: ^{12}C(n,n) E<4.4 MeV; calculated σ(E). ^{13}C calculated binding energy. Coupled-channel method.
1972Ro07,1972Ro08: ^{12}C(n,n) E<5 MeV; calculated σ(E). ^{13}C calculated levels. Feshbach, R-matrix theories; shell model, particle-rotator model.
1973Co27: ^{12}C(n,n); calculated σ(E). ^{13}C calculated levels.
1973Le02: ^{12}C(n,n) E<5 MeV; calculated σ(E;θ). ^{13}C calculated levels, level-width.
1981Az01: ^{12}C(n,n) E=1.9-5.2 MeV; calculated P(θ). ^{13}C resonances deduced Γ_n. Reaction matrix method.
1981KnZY: ^{12}C(n,n), E not given; analyzed data. ^{13}C levels deduced J, π. R-matrix.
1981KnZZ: ^{12}C(n,n) E not given; analyzed data. ^{13}C level deduced tentative J, π, configuration. R-matrix.
1982Kn02: ^{12}C(n,n) E=0.0-9 MeV; analyzed data. ^{13}C deduced levels, J, π, reduced widths. R-matrix analysis, comparison to model predictions.
1983To19: ^{12}C(n,n) E=7.03-8.56 MeV; analyzed phase-shift data. ^{13}C levels deduced J, π, Γ.
1986ToZY: ^{12}C(pol. n,n) E=12-17 MeV; analyzed data. ^{13}C deduced resonances. Phase-shift analysis.
1991Io01: ^{12}C(n,n) E=0.9-10 GeV/c; calculated σ vs beam momentum; deduced collective dual diffractive resonances role.
2003Am08: ^{12}C(n,n) E=0-5 MeV; calculated elastic σ, polarization, resonance effects. Sturmian expansions of multichannel interactions. Comparison with data.
2004Ke08: ^{12}C(n,n) E=7.5 MeV; calculated $\sigma(\theta)$. Comparisons with data.
2005Ch58: ^{12}C(n,n) E=7-26 MeV; compiled, analyzed $\sigma(\theta)$, analyzing power, total σ. ^{13}C deduced level and resonance parameters. Phase-shift analysis, comparison with previous results.
2005Pi16: ^{12}C(n,n) E≈0-5 MeV; analyzed elastic σ. ^{13}C deduced sub-threshold bound state and resonance features. Multichannel algebraic scattering theory.
2005WaZV: ^{12}C(n,n) E<3 GeV; analyzed σ.
2006Oh02: Analyzed E_x/S_n systematics.
2009We04: ^{12}C(n,n); analyzed σ, $\sigma(\theta)$.
2010Na18: ^{12}C(n,n); calculated σ, $\sigma(\theta)$, analyzing powers, phase shifts. No-core shell model, resonating-group method (NCSM/RGM). Comparison with experimental data.
2012Pr13: ^{12}C(n,n) E<20 MeV; calculated Westcott factors, resonance integrals and their uncertainties.
2016Fr09: ^{12}C(n,n) E<6.5 MeV; calculated elastic and reaction σ(E), deduced effect of particle-emitting resonances on the scattering cross section.
2017HaZY: ^{12}C(n,n) E=0-6.45 MeV; calculated σ, $\sigma(\theta)$, analyzing power.
2017Lo02: ^{12}C(n,n) E=17.29 MeV; analyzed differential $\sigma(\theta)$ data.
2018We08: ^{12}C(n,n) E=75 MeV; calculated $\sigma(\theta)$, σ; deduced optical model parameters.
2019Bl07: ^{12}C(n,n) E=0.050-1.040 MeV; calculated asymptotic normalization coefficients (ANC) for excited s-states in ^{13}C.

^{13}C Levels

E(level)†	J$^{\pi}$‡	Γ	L	E_n(res) (keV)	Comments
3090					E(level): See (1963Se13) who determined the relative reduced width for this bound $2s_{1/2}$ state; θ^2=0.20 *2*. They also set upper limits on widths for a proposed state at E_x=(5510) keV with $\Gamma_n \leq 0.01$ keV.
6864 *3*	5/2$^+$	6.9 keV	2	2079 *3*	E(level): From E_{res}=2079 keV *3* (1975He02); see also E_{res}(keV)=2076 *8* (1958Wi36), 2077 *3* (revised value from 1968Da31) and (1951Bo45,1963Pi03,1970CiZY,1973Ab07,1973Ho39). J$^{\pi}$: From (1958Wi36,1963Pi03,1973Ab07); see also J$^{\pi}\geq$3/2 (1951Bo45), 5/2 (1970CiZY). Γ: Average of Γ_{lab}(keV)=7 (1958Wi36), 7.9 (1963Pi03), $\Gamma_{c.m.}$=7 keV (1973Ab07); see also $\Gamma_{c.m.} \leq 11$ keV (1951Bo45), Γ_{lab}=9 keV (1970CiZY). L: From (1963Pi03,1970CiZY,1973Ab07); see also L>0 (1951Bo45). The dimensionless single particle reduced width, θ^2=0.006 (1958Wi36).

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^{12}C(n,n):res (continued)

^{13}C Levels (continued)

E(level)†	Jπ‡	Γ	L	E_n(res) (keV)	Comments
7546 *5*	(5/2)	1.2 keV *3*	2	2819 *5*	E(level): From E_{res}=2819 keV *5* (1975He02); see also (1950Fr61,1970CiZY). Jπ,L: From (1970CiZY). Γ: From (1975He02). See also Γ_{lab}=7 keV (1970CiZY).
7658 *9*	3/2+	124 keV *7*	2	2940 *10*	E(level): From E_{res}=2940 keV *10* (1973Fa06); see also (1951Bo45, 1958Wi36, 1970CiZY, 1973Ab07, 1973Ho39). Jπ: From (1958Wi36,1973Ab07); see also Jπ=3/2 (1951Bo45,1970CiZY). Γ: From (1973Fa06); see also Γ(keV)=120 (1951Bo45), 100 (1973Ab07), Γ_{lab}=90 keV (1958Wi36). L: From (1973Ab07,1970CiZY); see also L=1,2 (1951Bo45). θ^2=0.038 (1958Wi36).
8220 *40*	3/2+	1026 keV *15*	2	3530 *40*	E(level): From the unweighted average of E_{res}=3472 keV *15* (1973Fa06) 3520 keV *50* (1960Ts02), 3600 keV *50* (1966Li03). See other results in (1950Fr61, 1958Wi36, 1961Fo07, 1970CiZY, 1972Ga13, 1973Ab07, 1973Ho39). Jπ: From (1958Wi36, 1966Li03, 1972Ga13, 1973Ab07); see also Jπ=3/2 (1961Fo07,1970CiZY). Γ: Weighted average of 1050 keV *100* (1966Li03) and 1025 keV *15* (1973Fa06); see also Γ_{lab}=1690 keV (1958Wi36), $\Gamma_{c.m.}$(keV)=700 (1961Fo07), 900 (1973Ab07). Γ_n/Γ>0.99 (1966Li03), Γ_{n0}/Γ=1.00 (1972Ga13). L: From (1970CiZY,1973Ab07). θ^2=0.51 (1958Wi36), 0.35 (1966Li03).
8874 *14*	1/2−	205 keV *15*	1	4259 *15*	E(level): From E_{res}=4259 keV *15* (1973Fa06); see also E_{res}(keV)=4320 *50* (1960Ts02), 4250 *20* (1966Li03), 4260 *20* (1972Ga13) and (1950Fr61, 1961Fo07, 1970CiZY, 1973Ab07, 1973Ho39). Jπ: From (1966Li03,1972Ga13,1973Ab07); see also Jπ=1/2+ (1960Ts02), 1/2 (1961Fo07,1970CiZY). Γ: Weighted average of 180 keV *50* (1966Li03), 200 keV *40* (1972Ga13: lab value), 210 keV *15* (1973Fa06); see also Γ(keV)≈300 (1960Ts02), 220 (1961Fo07), 180 (1973Ab07). Γ_n/Γ>0.99 (1966Li03), Γ_{n0}/Γ=1.00 (1972Ga13). L: From (1970CiZY,1973Ab07). θ^2=0.03 (1966Li03).
9499.71 *6*	(9/2+)	1.72 keV *8*	1	4937.07 *7*	E(level): From E_{res}=4937.07 keV *7* (1980Ci03: Table 2); see also E_{res}(keV)=4940 *10* (1960Ts02), 4935 *4* (1969Da13), 4940 *11* (1975He02) and (1956Be98, 1961Fo07, 1970CiZY, 1972Ga13). Jπ: From (1982Kn02); see also Jπ≥1/2 (1961Fo07,1970CiZY), (1/2−,3/2−) (1972Ga13), (5/2−) (1980Ci03). Γ: From (1980Ci03); see also Γ(keV)≈20 (1960Ts02), ≤10 (1961Fo07), Γ_{lab}=14 keV (1970CiZY). Γ_{n0}=1.60 keV *4* (1980Ci03), Γ_{n0}/Γ=1.00 (1972Ga13). L: From (1972Ga13), but this result is inconsistent with later results.
9894.50 *17*	3/2−	23.7 keV *4*	1	5365.21 *18*	E(level): From E_{res}=5365.21 keV *18* (1980Ci03: Table 5b); see also E_{res}(keV)=5368 *5* (1969Da13), 5378 *13* (1975He02) and (1956Be98, 1961Fo07, 1970CiZY, 1972Ga13). Jπ: From (1972Ga13); see also Jπ>1/2 (1956Be98), ≥3/2 (1961Fo07), 3/2 (1970CiZY). Γ: Derived from (1980Ci03); see also Γ=30 keV (1961Fo07), Γ_{lab}=30 keV (1970CiZY). Γ_{n0}=20.6 keV *5* (1980Ci03), Γ_{n0}/Γ=0.70 *10* (1972Ga13). L: From (1970CiZY,1972Ga13).

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^{12}C(n,n):res (continued)

^{13}C Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	Γ	L	E_n(res) (keV)	Comments
10753.73 *30*	7/2$^-$	50.9 keV *6*	3	6297.07 *32*	E(level): From E_{res}=6297.07 keV *32* (1980Ci03: Table 5b); see also E_{res}(keV)=6294 *5* (1969Da13), 6295 keV *16* (1975He02) and (1953Ne01, 1957Bo13, 1961Fo07, 1970CiZY, 1972Ga13). J$^{\pi}$: From (1972Ga13); see also J$^{\pi}$>1/2 (1953Ne01), ≥7/2 (1961Fo07, 1970CiZY). Γ: From (1980Ci03); see also Γ=65 keV (1961Fo07), Γ_{lab}=55 keV (1970CiZY). Γ_{n0}=43.4 keV *9* (1980Ci03), Γ_{n0}/Γ=0.70 *10* (1972Ga13). L: From (1972Ga13).
10812.8 *6*		18.1 keV *10*		6361.1 *6*	E(level): From E_{res}=6361.1 keV *6* (1980Ci03: Table 5b). Γ: From (1980Ci03). Γ_{n0}=4.7 keV *3* (1980Ci03).
10941?				6500	E(level): From E_{res}=6500 keV (1961Fo07).
10994 *7*	(1/2$^+$)		0	6558 *8*	E(level): From E_{res}=6558 keV *8* (1972Ga13); see also E_{res}=6570 keV (1961Fo07). J$^{\pi}$,L: From (1972Ga13). Γ_{n0}/Γ=0.40 *10* (1972Ga13).
11076.01 *18*		4.0 keV *4*		6646.71 *20*	E(level): From E_{res}=6646.71 keV *20* (1980Ci03: Table 5b); see also E_{res}=6700 keV (1961Fo07). J$^{\pi}$: (1980Ci03) identified with the E_x=11080 keV; J$^{\pi}$=(1/2$^-$) state in (1976Aj04). Γ: From (1980Ci03). Γ_{n0}=2.52 keV *16* (1980Ci03).
11725 *46*	3/2$^-$	129 keV *40*		7350 *50*	E(level): From E_{res}=7350 keV *50* (1983To19). J$^{\pi}$,Γ: From (1983To19). Γ_{n0}/Γ=0.80 *8* and γ^2=29 keV *7* (1983To19).
11973 *90*	5/2$^+$	494 keV *80*		7620 *90*	E(level): From E_{res}=7620 keV *90* (1983To19). J$^{\pi}$,Γ: From (1983To19). E_n(res) (keV): See also E_{res}=(7400) keV (1961Fo07: identified with the E_x=11870 keV; J$^{\pi}$=(7/2$^-$) state). J$^{\pi}$: See also J$^{\pi}$=(≥5/2) (1961Fo07). Γ: See also Γ=(250) keV (1961Fo07). Γ_{n0}/Γ=0.51 *6* and γ^2=100 keV *12* (1983To19).
12071.9 *19*	(3/2$^-$)	81.5 keV *33*		7726.8 *21*	E(level): From E_{res}=7726.8 keV *21* (1980Ci03: Table 5b). J$^{\pi}$,Γ: From (1980Ci03). Γ_{n0}=69.0 keV *30* (1980Ci03).
12120 *70*	3/2$^+$	538 keV *65*		7759 *8*	E(level): From E_{res}=7780 keV *80* (1983To19); see also E_{res}=7759 keV *8* (1969Da13); 7730 (1961Fo07). J$^{\pi}$: From (1983To19); see also J$^{\pi}$=(≥7/2) (1961Fo07). Γ: From (1983To19); see also Γ=(200) keV (1961Fo07). Γ_{n0}/Γ=0.28 *5* and γ^2=58 keV *12* (1983To19).
12130 *46*	5/2$^-$	77 keV *30*		7790 *50*	E(level): From E_{res}=7790 keV *50* (1983To19). J$^{\pi}$,Γ: From (1983To19). Γ_{n0}/Γ=0.43 *6* and γ^2=29 keV *7* (1983To19).
12139 *65*	1/2$^+$	426 keV *70*		7800 *70*	E(level): From E_{res}=7800 keV *70* (1983To19). J$^{\pi}$,Γ: From (1983To19). Γ_{n0}/Γ=0.50 *7* and γ^2=49 keV *10* (1983To19).
12268 *65*	3/2$^-$	186 keV *50*		7940 *70*	E(level): From E_{res}=7940 keV *70* (1983To19). J$^{\pi}$,Γ: From (1983To19). Γ_{n0}/Γ=0.73 *8* and γ^2=36 keV *9* (1983To19).
12434 *46*	7/2$^-$	114 keV *40*		8120 *50*	E(level): From E_{res}=8120 keV *50* (1983To19). J$^{\pi}$,Γ: From (1983To19). Γ_{n0}/Γ=0.42 *6* and γ^2=39 keV *9* (1983To19). See also E_{res}=(8100) keV; J$^{\pi}$=(≥1/2); Γ=(150) keV (1961Fo07).
13568	7/2$^-$	619 keV *50*		9350	E(level): From E_{res}=9350 keV (1985To02); see also E_{res}=9300 keV (1961Fo07). J$^{\pi}$: From (1985To02); see also J$^{\pi}$=(≥1/2) (1961Fo07).

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^{12}C(n,n):res (continued)

^{13}C Levels (continued)

E(level)[†]	Jπ[‡]	Γ	L	E_n(res) (keV)	Comments
					Γ: From (1985To02); see also Γ=370 keV (1961Fo07). Γ_{n0}/Γ=0.18 *3* (1985To02).
14167	3/2−			10000	E(level): From E_{res}=10000 keV (1985To02). Jπ: From (1985To02).
14997	7/2−			10900	E(level): From E_{res}=10900 keV (1985To02). Jπ: From (1985To02).
15108.2 *12*	3/2−				T=3/2 (1987Hi03) E(level): From E_{res}(c.m.)=10161.9 keV *12*(1987Hi03). Jπ: From (1987Hi03). Γ_{n0}=0.34 keV *9* (1987Hi03: weak resonance anomaly).
15273	9/2+			11200	E(level): From E_{res}=11200 (1985To02). Jπ: From (1985To02). See also E_x=15181 keV from E_{res}=11100 keV, Γ=450 keV and J≥3/2 in (1961Fo07).
15458	3/2−			11400	E(level): From E_{res}=11400 (1985To02). Jπ: From (1985To02).
16103	(≥1/2)	230 keV		12100	E(level): From E_{res}=12100 keV (1961Fo07). Jπ,Γ: From (1961Fo07). See discussion in (1985To02) where an unresolved pair of states with $J^{\pi}=7/2^+$ and $5/2^-$ are suggested near E_x=16 MeV.
17533 *3*		17 keV *6*			T=(3/2) (1987Hi03) E(level): From E_{res}(c.m.)=12587 keV *3* (1987Hi03). Γ: From (1987Hi03); (J+1/2)Γ_{n0}/Γ=14% *3* (1987Hi03).
18081 *3*		12 keV *7*			T=(3/2) (1987Hi03) E(level): From E_{res}(c.m.)=13135 keV *3* (1987Hi03). Γ: From (1987Hi03); (J+1/2)Γ_{n0}/Γ=11% *4* (1987Hi03).
19512	5/2−	≥500 keV	0,1	15800	E(level): From E_{res}=15800 keV (1968Bo34,1987To03). Jπ: From (1987To03); see also Jπ=1/2 (1968Bo34). Γ: From (1987To03); see also Γ=500 keV (1968Bo34). L: From (1968Bo34).
20057 *4*		11 keV *8*			T=(3/2) (1987Hi03) E(level): From E_{res}(c.m.)=15111 keV *4* (1987Hi03). Γ: From (1987Hi03); (J+1/2)Γ_{n0}/Γ=15% *8* (1987Hi03).
20111	1/2−	1090 keV		16450	E(level): From E_{res}=16450 keV (1987To03). Jπ,Γ: From (1987To03). Γ_{n0}/Γ=0.16 (1987To03).
20111	5/2+	440 keV		16450	E(level): From E_{res}=16450 keV (1987To03). Jπ,Γ: From (1987To03). Γ_{n0}/Γ=0.05 (1987To03).
20185	7/2+	630 keV		16530	E(level): From E_{res}=16530 keV (1987To03). Jπ,Γ: From (1987To03). Γ_{n0}/Γ=0.11 (1987To03).
20296	7/2−	1560 keV		16650	E(level): From E_{res}=16650 keV (1987To03). Jπ,Γ: From (1987To03). Γ_{n0}/Γ=0.08 (1987To03).
20342	9/2+	320 keV		16700	E(level): From E_{res}=16700 keV (1987To03). Jπ,Γ: From (1987To03). Γ_{n0}/Γ=0.06 (1987To03).
20526	5/2−	≈500 keV		16900	E(level): From E_{res}=16900 keV (1987To03). Jπ,Γ: From (1987To03).
21703 *4*		18 keV *9*			T=(3/2) (1987Hi03)

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^{12}C(n,n):res (continued)

^{13}C Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	Γ	L	Comments
				E(level): From E_{res}(c.m.)=16757 keV *4* (1987Hi03). Γ: From (1987Hi03); (J+1/2)Γ_{n0}/Γ=21% *6* (1987Hi03).
23.00×10^{3} *19*	5/2^{+},1/2^{-},3/2^{-},7/2^{-}	≈1.5 MeV	0,1	E(level): Weighted average of 23.0 MeV *2* (1970De14) and 22.99 MeV *19* (1964Ha36,1965Ha21: using E_{res}=19.55 MeV *20* which is the average of 19.5 MeV *2* and 19.6 MeV *2*); see also E_{res}=19500 keV (1968Bo34). J$^{\pi}$: 5/2^{-} is concluded in (1970De14); yet they are unable to eliminate (1/2^{-}, 3/2^{+}, 7/2^{-}); see also J$^{\pi}$=1/2 (1968Bo34). Γ: Average of Γ(MeV)=2.0 (1968Bo34), 1.1 (1965Ha21), 1.2 (1965Ha21), 1.6 (1970De14). L: From (1968Bo34).

[†] Level energies are deduced using ^{12}C, ^{13}C and n masses from (2021Wa16: AME-2020) and the resonance energy E_n(res) except where noted. $E_x=S_n+E_{c.m.}$(relativistic).

[‡] Values determined in (1973Ab07,1972Ga13,1983To19,1985To02,1987To03) are via a phase-shift analysis of available data.