

$^{13}\text{C}(\text{n,n}),(\text{n,n}'),(\text{n,n}'\gamma)$

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

- [1979GI12](#): $^{13}\text{C}(\text{n,n})$ E=slow; measured spin-dependent scattering length using the pseudomagnetism method.
- [1979Ko26](#): $^{13}\text{C}(\text{n,n})$ E=0.51,0.68 MeV; measured small angle scattering; deduced coherent scattering length ($b=6.19$ fm 9). Free scattering cross section of ^{13}C $\sigma_0=4.16$ b 13.
- [1982Da05](#): $^{13}\text{C}(\text{n,n}),(\text{n,n}')$ E=10-18 MeV; measured $\sigma(\theta)$ for $\theta=30^\circ$ to 150° , $\sigma(\text{En})$. Legendre polynomial, optical model analyses.
- [1983Da22](#): $^{13}\text{C}(\text{n,n})$ E=7-15 MeV; measured $\sigma(\theta)$ for $\theta=30^\circ$ to 150° ; deduced spherical optical model parameters.
- [1983GI07](#): $^{13}\text{C}(\text{n,n})$ E=thermal; measured neutron phase shift, precession angle vs target polarization, $\sigma(\text{absorption})$. Deduced spin-dependent part of scattering length.
- [1985Pe10](#): $^{13}\text{C}(\text{n,n})$ E=24 MeV; measured $\sigma(\theta)$ vs E for $\theta=20^\circ$ to 160° . Microscopic optical model.
- [1987Re01](#): $^{13}\text{C}(\text{n,n}),(\text{n,n}')$ E=4.55-10.99 MeV; measured $\sigma(\theta_n, \text{En})$; deduced levels, decay characteristics. Tof.
- [1988Re09](#): $^{13}\text{C}(\text{n,n}),(\text{n,n}')$ E=8.25 MeV; measured neutron spectra. Multiple scattering analysis.
- [1989Re01](#): $^{13}\text{C}(\text{n,n}),(\text{n,n}')$ E=4.5-11 MeV; measured $\sigma(\theta)$; deduced $^{13}\text{C}(\text{n},\alpha)^{10}\text{Be}$ σ . R-matrix analysis.
- [2008Ha27](#): $^{13}\text{C}(\text{n,n})$; comparison of levels. Measured branching ratios for the neutron decay of ^{14}C states to $^{13}\text{C}^*[1/2^-]$, $3.089[1/2^+]+3.684[3/2^-]+3.854[5/2^+]$.
- [2012Pr13](#): $^{13}\text{C}(\text{n,n})$ E<20 MeV; calculated neutron thermal σ , Westcott factors, resonance integrals and their uncertainties using evaluated neutron libraries; deduced neutron-induced reaction σ deficiencies. Comparison with experimental data Atlas of Neutron Resonances.

Theory:

- [1977No07](#): $^{13}\text{C}(\text{n,n})$ E=low; calculated scattering parameters.
- [1985We02](#): $^{13}\text{C}(\text{n,n}),(\text{n,n}')$, $E_{\text{cm}}\approx 0.5$ -10 MeV; calculated $\sigma(\text{E})$; deduced potential parameters. Continuum shell model.
- [1994Sa73](#): $^{13}\text{C}(\text{n,n})$ E=11 MeV; calculated neutron spectra. Experimental MACHO code simulation.
- [1998Kr25](#): $^{13}\text{C}(\text{n,n})$ E=10,30,50 MeV; calculated optical potentials; deduced spin-orbit, spin-spin, tensor contributions. Hartree-Fock method, Skyrme forces.
- [1999Kr12](#): $^{13}\text{C}(\text{n,n})$, calculated optical potential for nucleus-nucleon scattering. Hartree-Fock theory.
- [2005MaZR](#): $^{13}\text{C}(\text{n,n}')$ E $\approx$ 1-11 MeV; analyzed data; deduced parameters. R-matrix analysis.
- [2005WaZV](#): $^{13}\text{C}(\text{n,n})$ E<3 GeV; analyzed σ .
- [2019Aq01](#): $^{13}\text{C}(\text{n,n})$ E=9-16 MeV; calculated elastic scattering $\sigma(\theta)$ MeV using nonlocal OMP; deduced potential parameters (dependent on target and energy), constant set of nonlocal parameters using fitting to the data.

 ^{13}C Levels

E(level)	J^π	Comments
0	$1/2^-$	E(level): See (1982Da05 , 1982ReZX , 1985Pe10 , 1989Re01 , 2008Ha27 , 2021Mc05).
3090	$1/2^+$	E(level): See (1982Da05 , 1982ReZX , 1989Re01 , 2008Ha27 , 2021Mc05). E(level): branching ratios and the total decay widths of ^{14}C excited states decaying to $^{13}\text{C}^*(0,3.09+3.68+3.85)+\text{n}$ are deduced (2008Ha27).
3685	$3/2^-$	E(level): See (1982Da05 , 1982ReZY , 1989Re01 , 2021Mc05).
3854	$5/2^+$	E(level): See (1982ReZY , 1989Re01 , 2021Mc05).
6864		E(level): The decay from $^{14}\text{C}^*(16.72$ MeV) to $^{13}\text{C}^*(6.864)+\text{n}$ was studied but the branching ratio could not be determined (2008Ha27).
7547		E(level): This level is involved in the 2n sequential decay of $E_x\approx 15.8$ -18.4 MeV ^{14}C states; it mainly neutron decays to $^{12}\text{C}_{\text{g.s.}}$; $\Gamma_n\approx 1.2$ keV (1987Re01).

[†] From R-matrix analysis in ([1989Re01](#)).

$^{13}\text{C}(\text{n,n}),(\text{n,n}'),(\text{n,n}'\gamma)$ (continued)

$\gamma(^{13}\text{C})$

$E_\gamma^\dagger$	$E_i(\text{level})$	J_i^π	E_f	J_f^π
169	3854	$5/2^+$	3685	$3/2^-$
595	3685	$3/2^-$	3090	$1/2^+$
764	3854	$5/2^+$	3090	$1/2^+$
3089	3090	$1/2^+$	0	$1/2^-$
3684	3685	$3/2^-$	0	$1/2^-$
3853	3854	$5/2^+$	0	$1/2^-$

[†] From (2021Mc05).

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Level Scheme

