C(^{26}Ne,^{25}Fγ) 2014Va02,2017Va24

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia, Anagha Chakraborty	NDS 205,1 (2025)	31-May-2025

Includes C(^{27}Na,^{25}Fγ),(^{28}Na,^{25}Fγ). Secondary beam also contained ^{24}F, ^{25}Ne, ^{29}Mg, and ^{30}Mg (2014Va02).

2014Va02: ^{25}F was produced from fragmentation of ^{26}Ne and ^{27,28}Na secondary beams, E=54 to 65 MeV/nucleon, on an "active" target of plastic scintillator (thickness=103 mg/cm^2), sandwiched by two carbon foils of thickness 51 mg/cm^2. ^{25}F nuclei were selected by SPEG spectrometer and identified by energy loss, total energy, time-of-flight, and focal-plane position information. Secondary beams of ^{24}F, ^{25,26}Ne, ^{27,28}Na and ^{29,30}Mg with energies 54-65 MeV/nucleon were obtained from fragmentation of ^{36}S primary beam, E=77.5 MeV/nucleon, bombarding a carbon target of thickness 348 mg/cm^2 at GANIL. Product nuclei were selected by the α spectrometer equipped with a 130 mg/cm^2 Al wedge at the dispersive focal plane. γ rays were detected by an array of 74 BaF_2 crystals. Measured Eγ, Iγ, particle-γ, particle-$\gamma\gamma$ coincidences, deduced ^{25}F level scheme. Comparison with shell model, and coupled-cluster calculations. Plastic scintillator target contained hydrogen as well.

2017Va24: ^{25}F was produced via one-proton knockout reaction from ^{26}Ne secondary beams, E=456 MeV/nucleon (at entrance), on a CH_2 target (thickness=922 mg/cm^2). ^{26}Ne was produced from fragmentation of ^{40}Ar beam, E=490 MeV/nucleon, on a ^{9}Be target (thickness=4 g/cm^2). Fragments were separated and selected by the fragment separator at GSI facility and identified event-by-event from energy loss and time-of-flight. γ rays were detected by 159 NaI crystals of the 4π Crystal ball detector. Two pairs of double-sided silicon strip detectors (DSSSD) were placed before and after the reaction target to determine the energy loss. Also two scintillation fiber detectors (GFIs), composed of 480 fibers and time-of-flight wall (TFW) composed of plastic scintillator paddles, were used in combination with DSSSD detectors to identify atomic number Z and mass number A. Measured ^{25}F energy spectrum, Eγ, neutron-γ coincidences, deduced ^{25}F resonance levels. Comparison with shell model calculations.

Other: 2013Va06.

^{25}F Levels

E(level)[†]	J$^\pi$[†]	Γ_r[@]	L[&]	Comments
0.0	(5/2$^+$)			
1720 *15*	(1/2$^+$)			
3090 *75*	(9/2$^+$)			
3440 *20*	(3/2$^+$)			
3830 *60*	(3/2$^+$)			
4195 *35*	(5/2$^+$)			
4.67×10^3[‡] *14*	(5/2$^+$)[#]	73 keV *70*	2	E(level): 4659 *104* in 2017Va24. E_r=389 *27* (2017Va24).
4.85×10^3[‡] *14*	(1/2$^-$)[#]	51 keV *49*	1	E(level): 4840 *104* in 2017Va24. E_r=571 *9* from 49 keV *9* (2017Va24) + Eγ=521.5 keV *3* (in ^{24}F adopted gammas in ENSDF). In 2017Va24 E_r=570 *9* using Eγ=521 keV *1* of ^{24}F from 2015Ca09. 2017Va24 measured Eγ=510. Possible configuration: (π0p$_{1/2}$)(π0d$_{5/2}$)^2 (2017Va24).
5.83×10^3 *18*		2.50×10^3 keV *44*		E(level): 5816 *146* in 2017Va24. E_r=1546 *106* (2017Va24).

[†] From 2014Va02, except where otherwise noted. Spin and parity assignments are based on shell model calculations and γ placements.

[‡] From 2017Va24, deduced using the resonance energy (listed in comments section) and Sn(^{25}F)=4280 keV *140* in AME2020 (2021Wa16). Values reported in 2017Va24, using Sn(^{25}F)=4270 keV *100* (2012Wa38 − AME2012), are listed in the comments.

[#] From L value and shell model calculations.

[@] Resonance width from 2017Va24.

[&] Proposed in 2017Va24 from the comparison of experimental and calculated single-particle widths.

C(^{26}Ne,^{25}Fγ) 2014Va02,2017Va24 (continued)

$\gamma(^{25}F)$

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Comments
750 *30*	12 *2*	4195	$(5/2^+)$	3440	$(3/2^+)$	
1720# *15*	58# *12*	1720	$(1/2^+)$	0.0	$(5/2^+)$	
1720# *15*	37# *7*	3440	$(3/2^+)$	1720	$(1/2^+)$	
2140@ *30*		3830	$(3/2^+)$	1720	$(1/2^+)$	E_γ: weaker γ from the single step fragmentation reaction in 2013Va06; absent in 2014Va02 (double-step fragmentation reaction).
3090‡ *75*	35 *7*	3090	$(9/2^+)$	0.0	$(5/2^+)$	
3440‡ *50*	100 *20*	3440	$(3/2^+)$	0.0	$(5/2^+)$	
3830‡ *60*	89 *18*	3830	$(3/2^+)$	0.0	$(5/2^+)$	
4210‡ *80*	52 *10*	4195	$(5/2^+)$	0.0	$(5/2^+)$	

† From 2014Va02, except where otherwise noted. For Iγ, the uncertainties based on a general statement in 2014Va02 that these are below 20%.
‡ Decomposed from a broad structure of the γ-ray spectrum (2014Va02).
# Multiply placed with intensity suitably divided.
@ Placement of transition in the level scheme is uncertain.

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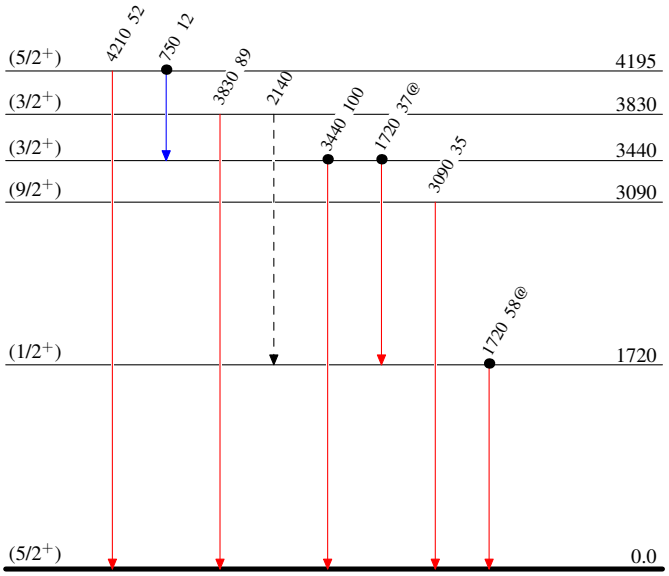
Level Scheme

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)
- Coincidence



$^{25}_{9}F_{16}$