^{17}N $\beta^-\alpha$ decay 1994Do08

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

Parent: ^{17}N: E=0; $J^\pi=1/2^-$; $T_{1/2}$=4.173 s *4*; Q($\beta^-\alpha$)=2320 *15*; %$\beta^-\alpha$ decay=0.0025 *4*

^{17}N-$T_{1/2}$: From weighted average of (1976Oh05,1972Al42).

^{17}N-Q($\beta^-\alpha$): From (2021Wa16).

1993Bu21: ^{17}N($\beta^-\alpha$); measured β-delayed E_α, I_α. The alphas (E_α=1.24 and 1.40 MeV) result from decay of the 7.99 MeV and 8.20 MeV states in ^{17}O. More details in (1994Do08).

1994Do08: A thick target was bombarded by 600 MeV protons to produce ^{17}N ions that were selected by the TISOL separator. The ^{17}N beam was implanted into a thin carbon-foil collector. Thin surface barrier detector pairs counted the decay α particles in coincidence with ^{13}C recoils.

$T_{1/2}$=3.92 s *44* was reported which is in good agreement of 4.173 s *4* (weighted average of 1976Oh05: 4174 ms *4* and 1972Al42: 4169 ms *8*). The α spectrum was reasonably fitted with a K-matrix parametrization using the known resonances at ^{17}O*(7.985 and 8.204 MeV). Although two states are sufficient to fit the α-spectrum, the possibility of decay from the broad ^{17}O*(7.56) state cannot be entirely discounted.

A small contamination of ^{18}N in the beam was used to make a relative normalization of the ^{17}N and ^{18}N activities; then using the lifetimes and ^{18}N decay results from (1989Zh04), the absolute $\beta\alpha$ branching of ^{17}N was determined to be (2.5 *4*)×10^{-5}. The $\beta\alpha$ branching intensities to ^{17}O*(7.985, 8.204) were found to be (1.5 *3*)×10^{-5} and (9.8 *20*)×10^{-6}, respectively. An upper limit of delayed α decay intensity from ^{17}O*(7.56), <6.9×10^{-7}, is deduced; though the small Γ_α/Γ=0.0002 for this state corresponds to a rather large I <3.5% beta-decay intensity to this state that could be observed in other decay channels. Another possible level at ^{17}O*(8.18) could influence the $\beta\alpha$ decay, but the best fit in this experiment showed a minimal and excludable effect.

^{13}C Levels

E(level)	J^π
0.0	$1/2^-$

Delayed Alphas (^{13}C)

E(α)	E(^{13}C)	I(α)†	E(^{17}O)
≈918	0.0	<6.9×10^{-5}	7559
1246 *12*	0.0	1.5×10^{-3} *3*	7990
1410 *5*	0.0	9.8×10^{-4} *20*	8200

† Absolute intensity per 100 decays.

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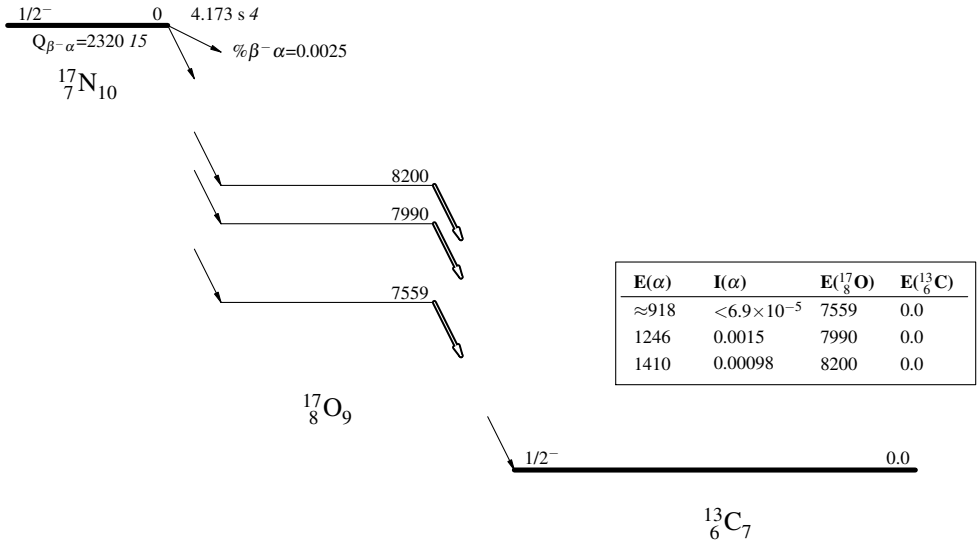
Decay Scheme

I(α) Intensities: I(α) per 100 parent decays



E(α)	I(α)	E($^{17}_{8}$O)	E($^{13}_{6}$C)
≈918	$<6.9\times10^{-5}$	7559	0.0
1246	0.0015	7990	0.0
1410	0.00098	8200	0.0