

¹⁶⁶Re α decay (2.25 s) 1996Pa01,1992Me10,1984Sc06

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 195,1 (2024)	19-Sep-2023

Parent: ¹⁶⁶Re: E=0.0; T_{1/2}=2.25 s 2I; Q(α)=5520 60; % α decay<24

¹⁶⁶Re-J^π: (7⁺) in 2021Ko07, as proposed by 1992Me10, but no assignment is recommended in ¹⁶⁶Re Adopted Levels in the ENSDF database, although, (7⁺) is discussed.

¹⁶⁶Re-T_{1/2}: From ¹⁶⁶Re Adopted Levels in ENSDF database (2008Ba14 evaluation).

¹⁶⁶Re-Q(α): From 2021Wa16.

¹⁶⁶Re-% α decay: The α branching ratio has not been directly measured. From comparison of their excitation-function data for the various nuclides they studied, 1978Sc26 estimate that % α for ¹⁶⁶Re lies between 30 and 100. In ¹⁶⁶Re Adopted Levels in ENSDF database (2008Ba14 evaluation), an upper limit of 24% is given.

1996Pa01: produced as α decay product of ¹⁷⁰Ir, which was produced in the ¹⁰⁶Cd(⁷⁰Ge,3p3n) reaction with E(⁷⁰Ge)=354 MeV.

The reaction products were separated in flight using the Daresbury recoil mass separator and were implanted in a double-sided silicon-strip detector (energy resolution≤20 keV). Position and time correlations between the parent and daughter nuclides were determined. E α and T_{1/2} were reported.

1992Me10: ¹⁶⁶Re was produced in the ¹⁴¹Pr(³²S,7n) reaction, with E(³²S)=235 MeV. The beam energy was degraded using Ta foils to measure excitation functions from ≈175 to ≈204 MeV. The reaction products were collected using a He-jet system with a fast tape transport. The samples were counted using a 450-mm² surface-barrier α detector mounted between a γ X and a 70% γ detector. Reported T_{1/2}, E α , E γ , I γ .

1984Sc06: ¹⁶⁶Re produced in the ¹⁴⁴Sm(²⁷Al,5n) reaction, with E(²⁷Al) between 130 and 155 MeV. Recoil nuclei were collected and transported using a He-jet and a fast tape-transport system. α 's were studied with a 300 mm²×100 μ m-thick Si surface-barrier detector. Reported T_{1/2} and E α .

1982De11: produced by ⁶³Cu bombardment of enriched targets of ¹⁰⁷Ag, ¹⁰⁹Ag, ¹⁰⁸Cd, ¹¹⁰Cd, ¹¹³In, ¹¹²Sn and ¹¹⁶Sn. Beam energy was degraded using Ni foils to a range from 245 to 300 MeV. The reaction products were transported using a He-jet, fast-transport system. α 's were measured using a Si surface-barrier detector. Measured E α .

1978Sc26: ¹⁶⁶Re produced in the ⁹³Nb(⁸⁴Kr, α 7n) and ⁸⁹Y(⁸⁴Kr,7n) reactions, with E(⁸⁴Kr)=5.6 MeV/u and E(⁸⁶Kr)=7.03 MeV/u. The beam energies were reduced using Ti degrader foils. The reaction products were transported using a He-jet transport system. The activities were counted using three Si surface-barrier detectors, one in a multiscaling mode. Reported T_{1/2} and E α .

1984Sc06 suggest that the assignment of an α activity having E α =5495 10 to ¹⁶⁶Re by 1978Sc26 is incorrect, reporting instead E α =5372 10. This calls into question the assignment of the α activity to ¹⁶⁶Re as reported by 1982De11, since 1984Sc06 suggest that they may have based their assignment on that of 1978Sc26. However, subsequent studies, especially 1996Pa01, have shown that the E α value to be associated with the ¹⁶⁶Re decay is not as low as 5372 keV but is greater than 5500 keV, thus invalidating the assignment by 1984Sc06. Note also, however, that 1996Pa01 report that E α =5518 5 for the ¹⁶⁵Re decay. Thus, α energy alone is not sufficient to provide a unique mass assignment from the earlier studies; and the T_{1/2} values for ¹⁶⁶Re and ¹⁶⁵Re are quite similar. The possibility thus exists that the T_{1/2} and E α values from these earlier studies (1978Sc26,1982De11) may have been affected by the presence of ¹⁶⁵Re in the samples. Here, however, we have included the data from these studies as reported.

¹⁶²Ta Levels

E(level)	Comments
0+x	E(level): energy of level populated by α is not known.

α radiations

E α	E(level)	I α [†]	HF [†]	Comments
5522 7	0+x	100	>0.15	E α : weighted average of: 5495 10 (1978Sc26); 5527 4 (1982De11); 5501 13 (1992Me10); and 5533 10 (1996Pa01). I α : only one α group is reported.

[†] The nuclear radius parameter r₀(¹⁶²Ta)=1.553 13 is deduced from interpolation (or unweighted average) of radius parameters of

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α radiations (continued)

the adjacent even-even nuclides.

‡ For absolute intensity per 100 decays, multiply by <0.24.