Contribution ID: **112** Type: **Poster Contribution**

Estimation of α-decay branching and T1/2 of even-even alpha emitters using systematics of r0 parameters

The spin–independent part of Preston's equations [1] of alpha-decay radioactivity is used to calculate nuclear radius parameter (r0) of various even–even alpha emitters. In this approach, the r0 parameter is determined by defining the calculated transition probability for an alpha transition from parent's ground state to daughter's ground state (0+ to 0+) to be equal to the experimental transition rate. [2]. It is observed that, the variation of r0 parameters shows a regular behavior with parent neutron numbers i.e. the value of r0 parameters for each nuclide lies on fairly smooth curves with exception at major and minor shell closures [2, 3]. A similar kind of pattern has also been observed for alpha reduced widths [4-6]. In present work the above said regular behavior of r0 parameters is utilized to calculate α-decay half-lives and branching of an observed alpha transition in various even-even nuclides namely 110Te, 110Xe, 166W, 186Pt, 178Hg, 186Pb, 250Fm and 252No. In order to calculate α-decay branching and half-lives, we used Evaluated Nuclear Structure Data File (ENSDF) analysis program namely ALPHAD [7] and for these calculations r0 parameter is obtained from systematics of neighboring nuclides. On the basis of present study, we also attempted to predict best possible half-lives and α-branching among group of experimentally measured values. These predicted values could be useful for future experimental investigations.

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